

Handwritten notes in cursive script, possibly "100" and "100" with a flourish below.

na

ARITHMETICIAN'S GUIDE;

OR,

A Complete Exercise Book, &c.



THE
ARITHMETICIAN'S GUIDE:

OR, A

Complete Exercise Book,

FOR

THE USE OF PUBLIC SCHOOLS,

AND

PRIVATE TEACHERS.

THE SECOND EDITION,

REVISED AND CORRECTED.

K
BY WILLIAM TAYLOR,

TEACHER OF THE MATHEMATICS, AND LAND SURVEYOR,
BIRMINGHAM.

Birmingham,

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MDCXCIII.



THE
PREFACE.

EVERY community experiences the important advantages arising from an useful education of the individuals who compose it. He, therefore, who has any thing to offer which can promote this great object, or facilitate the means of acquiring it, has some claim to attention. In the following work, I flatter myself, it will be found, I have proceeded upon a plan which will shorten the time usually spent in a course of arithmetical study, and, therefore, if I

have succeeded, I have done some service both to the tutor and pupil, by rendering the task of education more easy and agreeable.

IN a book of this kind, nothing should be omitted which it can properly include, while great regard throughout must be had to the capacities of pupils, and what is most useful and common in business, principally attended to.

IN composing, therefore, a regular treatise of practical arithmetic, I have endeavoured to attain the proper objects.—A variety of such new and useful questions as are most likely to occur in business, are introduced, with their answers annexed; and in order to render the rules still more clear and familiar to the pupil, I have, where I deemed it necessary, given at full length

length, the *work* of the first examples in each rule, most of which are varied or proved by some other methods of work. This, though it has never been attended to by arithmetical writers, is, I am persuaded, of the first importance, as it will tend still more to convince the learners of the truth of the rules.

THE *Arithmetician's Guide and Key*, I flatter myself, will be found to furnish a system of arithmetic sufficiently extensive; will enable teachers with greater ease to themselves, and benefit to their scholars, to expedite the business of a numerous school; and afford all those, who are acquainted with only the first principles of this useful and necessary branch of learning, the means of obtaining a competent knowledge of it; and in order to make this book as useful as possible

possible, I have added several examples of the different Forms of Acquittances, Promissory Notes, Bills of Exchange, Letters of Advice, Letters of Credit, &c.

I have nothing further to add, but a return of my sincere thanks to all those gentlemen whose kind approbation and encouragement have now established the use of this book, and favoured me with their judicious remarks.

I am,

With the utmost esteem,

Their's and the public's most obliged

Obedient humble servant,

20 MA 59

W. TAYLOR.

BIRMINGHAM,

1793.

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Characters used in this Work.

- ∴ Signifies Ergo ; or therefore.
- + Plus, or Addition.
- Minus, or Subtraction.
- × Multiplication.
- ÷ Division ; as $9 \div 3$, is 9 divided by 3, this is sometimes written like a fraction thus $\frac{9}{3}$.
- ∴ Proportion.
- = Equality. 20 MA 59
- √ Square Root.
- ∛ Cube Root.

ARITHMETICIAN'S GUIDE.

NUMERATION,

IS the expressing of any proposed number, either by words or characters.

TABLE I.

Hundreds of millions	Tens of millions	Millions	Hundreds of thousands	Tens of thousands	Thousands	Hundreds	Tens	Units
9	8	7	6	5	4	3	2	1
9	8	7	6	5	4	3	2	
	9	8	7	6	5	4	3	
		9	8	7	6	5	4	
			9	8	7	6	5	
				9	8	7	6	
					9	8	7	
						9	8	
							9	

TABLE II.

Periods	Quadrillions.	Trillions.	Billions.	Millions.	Units.
	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Half per	th. un.	th. un.	th. un.	th. un.	c.x.t. c.x.u.
	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Figures	345,432.	615,423.	689,345.	214,632.	324,516.

EXAMPLES. (Page 1 and 2.)

- (1) Write down 1785, in words at length.
- (2) Write down 324516, in words at length.
- (3) Write down 615423, in words at length.
- (4) Write down 7654321, in words at length.
- (5) Write down 87654321, in words at length.
- (6) Write down 987654321, in words at length.
- (7) Write down 426784326534, in words at length.
- (8) Write down 642134210345648, in words at length.
- (9) Write down 234563214362156634, in words at length.
- (10) Write down 54326428916543465346, in words at length.
- (11) Write down 864215642000468004562, in words at length.
- (12) Write down 2146862898764842000698042, in words at length.

ADDITION,

Teacheth to add several numbers of the same denomination into one sum.

EXAMPLES. (Page 2.)

(1)	2	(2)	63	(3)	423
	3		45		315
	4		72		531
	5		81		414
	3		54		612
	1		18		234
	4		72		621
	2		63		414
	3		81		711
	6		72		144
	3		54		621
	<u>36</u>		<u> </u>		<u> </u>

Addition.

(4)	(5)	(6)	(7)	(8)
423	621	126	2124	3123
342	414	216	4212	2322
234	324	162	1314	4212
423	450	450	2106	3123
540	108	360	4212	1224
612	351	414	5121	2142
234	513	216	1215	6021
405	621	621	5121	7110
630	711	513	1215	4023
216	810	324	2151	1215
522	324	414	6030	4122
324	234	720	8100	3240
801	423	603	4563	4023
423	216	234	5211	5112
612	144	801	1413	2034
108	216	126	8010	1512
846	801	243	9432	2115
135	243	162	2124	6012
243	522	450	5112	1701
513	414	342	6201	2340

(9)	(10)	(11)	(12)
4113	42102	72621	62172
1224	31050	40212	31212
2115	52101	34227	12123
3213	41121	67572	41211
4104	22023	21123	57672
5211	54423	88839	41463
6012	21015	42372	88254
1701	14121	67581	84645
2043	41211	12330	172729
4104	63432	21123	63801
5040	10215	10242	42111
1413	63126	63711	14211
8001	12012	81828	20130
1863	23400	72648	56142
2700	34011	45423	18729
1710	10413	10242	46872
2223	21231	23454	87489
3132	41130	61272	62127
1413	62424	12411	81423
2034	87345	45630	71252

Subtraction.

APPLICATION. (Pages 2 and 3.)

Quest. 1. What is the sum of 34263, 53163, 8172, and 846? Answer 96444.

2. Add 63, 8154, 6201, and 99 together.

Answer 14517.

3. How many pence are there in a crown, a half crown, a shilling, and a six-pence? Answer 108.

4. How many days are there from the first day of January 1787, to the 30th day of April in the same year, both inclusive? Answer 120 days.

5. Suppose a child was born in the year of our Lord 1787, in what year will he be sixty years of age? Answer 1847.

6. Suppose I lease a piece of land for 116 years, in the year of our Lord 1787, I desire to know when the lease will expire? Answ. In the year 1903.

SUBTRACTION,

Is the taking one sum or number of the same denomination from another to find the difference.

EXAMPLES. (Page 3.)

$$\begin{array}{r}
 \text{(1)} \\
 \text{From} \quad 86421689765 \\
 \text{Take} \quad 12110346243 \\
 \hline
 \text{Remains} \quad 74311343522 \\
 \hline
 \text{Proof} \quad 86421689765
 \end{array}$$

$$\begin{array}{r}
 \text{(2)} \\
 \text{From} \quad 76543895621 \\
 \text{Take} \quad 12341234510 \\
 \hline
 \text{Remains} \quad 64202661111
 \end{array}$$

$$\begin{array}{r}
 \text{(3)} \\
 67898765434 \\
 21324151213 \\
 \hline
 \hline
 \hline
 \end{array}$$

$$\begin{array}{r}
 \text{(4)} \\
 72896789678 \\
 24121304523 \\
 \hline
 \hline
 \hline
 \end{array}$$

$$\begin{array}{r}
 \text{(5)} \\
 54321234567 \\
 21346121346 \\
 \hline
 \hline
 \hline
 \end{array}$$

$$\begin{array}{r}
 \text{(6)} \\
 98765432148 \\
 34561234567 \\
 \hline
 \hline
 \hline
 \end{array}$$

$$\begin{array}{r}
 \text{(7)} \\
 86596417534 \\
 23214282123 \\
 \hline
 \hline
 \hline
 \end{array}$$

$$\begin{array}{r}
 \text{(8)} \\
 68987687637 \\
 24524518421 \\
 \hline
 \hline
 \hline
 \end{array}$$

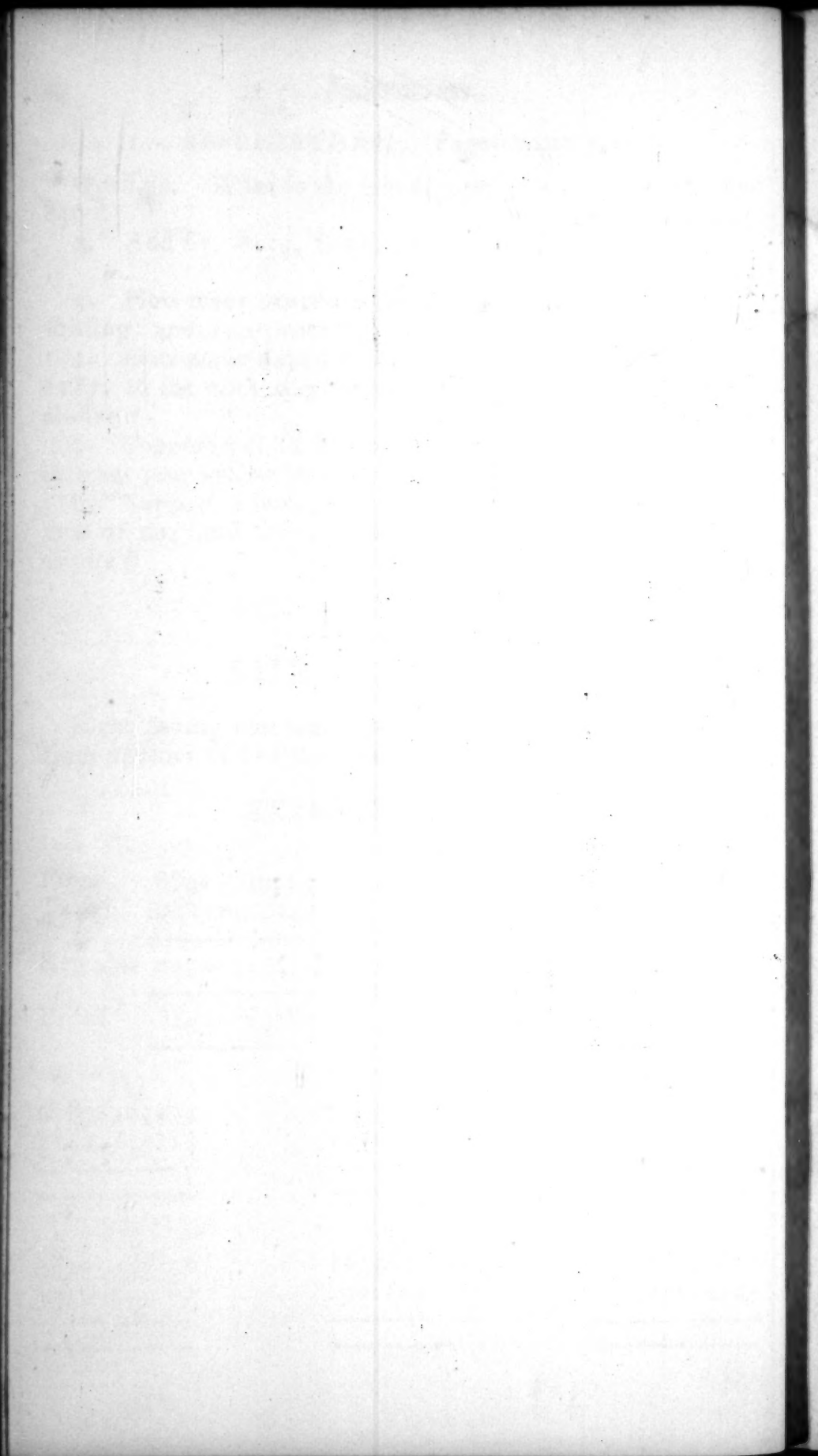
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5
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Multiplication.

7

EXAMPLES (Page 3.)

	(1)	(2)	(3)
Multiplicand	4243214646	3123546354	5462145612
Multiplier	2	3	4
Product	8486429292		

P A G E 4.

(4) 6372458163 5	(5) 2345678946 6	(6) 1234567809 7
(7) 2164235472 8	(8) 5481728163 9	(9) 6213246453 10
(10) 4131621045 11	(11) 2120462172 12	(12) 3124431612 13

RULE.—When the multiplier consists of several figures, multiply the whole multiplicand by each figure in the multiplier, setting down the first figure of every line directly under the figure you are multiplying by, the sum of all the lines is the product.

(13) 3412342629 23	(14) 2434326246 36	(15) 4536423432 45
78483880467	87635744856	204139054440
(16) 5472635481 54	(17) 2142621333 63	(18) 4237125372 72
295522315974	134985143979	305073026784

(19)

8

Multiplication.

$$\begin{array}{r} (19) \ 421262136 \\ \quad \quad \quad 234 \\ \hline \end{array}$$

$$\underline{\underline{98575339824}}$$

$$\begin{array}{r} (20) \ 531621702 \\ \quad \quad \quad 324 \\ \hline \end{array}$$

$$\underline{\underline{172245431448}}$$

$$\begin{array}{r} (21) \ 546217263 \\ \quad \quad \quad 426 \\ \hline \end{array}$$

$$\underline{\underline{232688554038}}$$

PAGE 5.

$$\begin{array}{r} (22) \ 728163432 \\ \quad \quad \quad 368 \\ \hline \end{array}$$

$$\underline{\underline{267964142976}}$$

$$\begin{array}{r} (23) \ 431162163 \\ \quad \quad \quad 248 \\ \hline \end{array}$$

$$\underline{\underline{106928216424}}$$

$$\begin{array}{r} (24) \ 324637254 \\ \quad \quad \quad 567 \\ \hline \end{array}$$

$$\underline{\underline{184069323018}}$$

$$\begin{array}{r} (25) \ 638143245 \\ \quad \quad \quad 2345 \\ \hline \end{array}$$

$$\underline{\underline{1496445909525}}$$

$$\begin{array}{r} (26) \ 234621423 \\ \quad \quad \quad 3246 \\ \hline \end{array}$$

$$\underline{\underline{761581139058}}$$

$$\begin{array}{r} (27) \ 423620172 \\ \quad \quad \quad 4295 \\ \hline \end{array}$$

$$\underline{\underline{1794031428420}}$$

$$\begin{array}{r} (28) \ 542034522 \\ \quad \quad \quad 3674 \\ \hline \end{array}$$

$$\underline{\underline{1991434833828}}$$

$$\begin{array}{r} (29) \ 621405816 \\ \quad \quad \quad 32472 \\ \hline \end{array}$$

$$\underline{\underline{20178289657152}}$$

$$\begin{array}{r} (30) \ 534620438 \\ \quad \quad \quad 45612 \\ \hline \end{array}$$

$$\underline{\underline{24385107418056}}$$

$$\begin{array}{r} (31) \ 423546372 \\ \quad \quad \quad 23124 \\ \hline \end{array}$$

$$\underline{\underline{9794086306128}}$$

$$\begin{array}{r} (32) \ 613854724 \\ \quad \quad \quad 42354 \\ \hline \end{array}$$

$$\underline{\underline{25999202980296}}$$

PAGE 6.

$$\begin{array}{r} (33) \ 123456789 \\ \quad \quad \quad 324513 \\ \hline \end{array}$$

$$\underline{\underline{40063332968757}}$$

$$\begin{array}{r} (34) \ 987654321 \\ \quad \quad \quad 315423 \\ \hline \end{array}$$

$$\underline{\underline{311528888892783}}$$

$$\begin{array}{r} (35) \ 621423234 \\ \quad \quad \quad 234625 \\ \hline \end{array}$$

$$\underline{\underline{145801426277250}}$$

$$\begin{array}{r} (36) \ 432324126 \\ \quad \quad \quad 245674 \\ \hline \end{array}$$

$$\underline{\underline{106210797330924}}$$

(37)

Multiplication.

9

$$\begin{array}{r} (37) \ 235620432 \\ \quad 4523413 \\ \hline 1065808525174416 \end{array}$$

$$\begin{array}{r} (38) \ 315728163 \\ \quad 5423216 \\ \hline 1712262025232208 \end{array}$$

P A G E 7.

$$\begin{array}{r} (39) \ 312471423 \\ \quad 41235678 \\ \hline 12884970983029794 \end{array}$$

$$\begin{array}{r} (40) \ 234567891 \\ \quad 23214678 \\ \hline 5445418058704098 \end{array}$$

$$\begin{array}{r} (41) \ 478216243 \\ \quad 123456789 \\ \hline 59039041808423727 \end{array}$$

$$\begin{array}{r} (42) \ 123456789 \\ \quad 478216243 \\ \hline 59039041808423727 \end{array}$$

ABBREVIATIONS.

RULE.—When cyphers are placed between the significant figures in the multiplier, omit them, and place the first figure in each particular product under its respective multiplier. When there are cyphers at the right hand of either or both the multiplier and multiplicand, proceed as before, neglecting the cyphers until the particular products are added together, and to that sum place the number of cyphers that are at the end of both factors to the right hand.

$$\begin{array}{r} (43) \ 230040702 \\ \quad 402300504 \\ \hline 92545490355113808 \end{array}$$

$$\begin{array}{r} (44) \ 630702009 \\ \quad 203400603 \\ \hline 128285168943911427 \end{array}$$

P A G E S 8 and 9.

$$\begin{array}{r} (45) \ 720203400 \\ \quad 403020270 \\ \hline 290256568722918000 \end{array}$$

$$\begin{array}{r} (46) \ 403220270 \\ \quad 720203400 \\ \hline 290256568722918000 \end{array}$$

(47)

Multiplication.

$$\begin{array}{r} (47) \quad 987654321 \\ \quad \quad 10 \\ \hline \end{array}$$

$$\begin{array}{r} 9876543210 \\ \hline \end{array}$$

$$\begin{array}{r} (49) \quad 1987654 \\ \quad \quad 1000 \\ \hline \end{array}$$

$$\begin{array}{r} (48) \quad 19876543 \\ \quad \quad 100 \\ \hline \end{array}$$

$$\begin{array}{r} (50) \quad 198765 \\ \quad \quad 10000 \\ \hline \end{array}$$

BY PARTS.

RULE.—When the multiplier is the product of two or more numbers in the table, multiply continually by those parts, instead of the whole number at once.

$$\begin{array}{r} \text{Multiply } (51) \quad 123456789 \\ \text{By} \quad \quad \quad 15 \\ \hline \end{array}$$

$$\begin{array}{r} 1851851835 \\ \hline \end{array}$$

$$\begin{array}{r} (52) \quad 423547281 \\ \quad \quad 25 \\ \hline \end{array}$$

$$\begin{array}{r} 10588682025 \\ \hline \end{array}$$

$$\begin{array}{r} (53) \quad 324603729 \\ \quad \quad 36 \\ \hline \end{array}$$

$$\begin{array}{r} 11685734244 \\ \hline \end{array}$$

$$\begin{array}{r} (54) \quad 637146243 \\ \quad \quad 56 \\ \hline \end{array}$$

$$\begin{array}{r} 35680189608 \\ \hline \end{array}$$

$$\begin{array}{r} (55) \quad 342635481 \\ \quad \quad 72 \\ \hline \end{array}$$

$$\begin{array}{r} 24669754632 \\ \hline \end{array}$$

$$\begin{array}{r} (56) \quad 241281243 \\ \quad \quad 81 \\ \hline \end{array}$$

$$\begin{array}{r} 19543780683 \\ \hline \end{array}$$

$$\begin{array}{r} (57) \quad 816021729 \\ \quad \quad 1321 \\ \hline \end{array}$$

$$\begin{array}{r} 107714868228 \\ \hline \end{array}$$

$$\begin{array}{r} (58) \quad 456021723 \\ \quad \quad 144 \\ \hline \end{array}$$

$$\begin{array}{r} 65667128112 \\ \hline \end{array}$$

$$\begin{array}{r} (59) \quad 420480172 \\ \quad \quad 112 \\ \hline \end{array}$$

$$\begin{array}{r} 47093779264 \\ \hline \end{array}$$

$$\begin{array}{r} (60) \quad 523602432 \\ \quad \quad 1728 \\ \hline \end{array}$$

$$\begin{array}{r} 904785002496 \\ \hline \end{array}$$

APPLI-

Division.

11

APPLICATION (Pages 9 and 10.)

Quest. 1. An army of 89460 soldiers having plundered a city, took so much that when it was divided among them, each man had 50l. what was the value of the plunder?

Answer £. 4473000.

2. There are 40 men employed to complete a certain piece of work, each of which is to have 5l. what will the whole expence amount to?

Answer 200l.

3. What is the content of a piece of land whose length is 39 yards, and breadth 20 yards?

Answer 780 yards.

4. In the field of battle there are 268 soldiers in rank, and 118 in file, what number of soldiers are in the field?

Answ. 31624 soldiers.

5. In a printed book there are 235 pages, 45 lines in a page, and 50 letters in a line, how many did it take to compose the book?

Answ. 528750 letters.

6. In a certain town there are 10000 houses, and in every house 5 persons, how many persons are in the town?

Answ. 50000 persons.

7. What number taken from the square of 50 will leave 20 times 100?

Answ. 500.

D I V I S I O N.

IS the dividing of any given number into any proposed number of equal parts.

EXAMPLES (Page 10).

(1)	Dividend	(2)	(3)
Divisor	2)8486429292	3)9370639062	4)21848582448
Quotient	4243214646	3123546354	
(4)	5)31862290815	(5)	6)14074073676
(7)	8)17313883776	(8)	9)49335553467
(10)	11)45447831495	(611)	12)25445546064

PAGE

PAGES 11, 12, 13, 14, 15, 16, 17, and 18.

(12)
13)40617610956(312443161239

.16

13

.31

26

.57

52

.56

52

.41

39

.20

13

.79

78

.15

13

.26

26(13)
23)78483880467(341234262969

.94

92

.28

23

.53

46

.78

69

.98

92

.60

46

144

138

..66

46

.207

207(14)
36)87635744856(

(16)

54)295522315974(

(18)

72)303073026784(

(20)

324)172245431448(

(22)

368)267964142976(

(24)

567)184069323018(

(26)

3246)761581139058(

(28)

3674)1991434833828(

(15)
45)204139054440(

(17)

63)134985143979(

(19)

234)98575339824(

(21)

426)232688554038(

(23)

248)106928216424(

(25)

2345)1496445909525(

(27)

4235)1794031428420(

(29)

32472)20178289657152(

23124)9794086306128(

(33)
324513)40063332968757(

(35)
234625)145801426277250(

(37)
4523413110658085251744160

(39)
41235678)12884970983029794(

123456789)59039041808423727(

(42)
478216243)59039041808423727(

ABBREVIATIONS.

RULE.—When the Divisor has cyphers on the right of it, you may strike them off and divide without them; but the same number of figures must be struck off from the right of the dividend, and affixed to the last remainder.

P A G E S 19 and 20.

(43)
402300504)92545490355113808(

(44)
203400603)128285168943911427(

(45)
403020270)290256568722918000(

(46)
720203400)290256568722918000(

(47)
10)987654321C(

(48)
100) 1987654300(

(49)
1000) 1987654000(

(50)
10000)1987650000(

BY PARTS.

RULE.—When the divisor is the product of two or more numbers in the table, divide continually by those numbers, instead of the whole divisor.

If there be any remainders after such divisions, multiply the last remainder by the preceding divisor, and to the product add the preceding remainder, multiply this sum by the next preceding divisor, and to the product add the next preceding remainder, and so on till you have gone through all the divisors and remainders to the first which will be the true remainder.

(51)
Divide 1851851835 by 15

$$15 \left\{ \begin{array}{r} 3) 1851851835 \\ \hline 5) 617283945 \\ \hline 123456789 \end{array} \right.$$

(52)
Divide 10588682025 by 25

(53)
Divide 11685734244 by 36

(55)
Divide 24669754632 by 72

(57)
Divide 107714868228 by 132

(59)
Divide 47093779264 by 112

(54)
Divide 35680189608 by 56

(56)
Divide 19543780683 by 81

(58)
Divide 65667128112 by 144

(60)
Divide 904785002496 by 1728

APPLICATION (Page 21).

Quest. 1. An army of 89460 men having plundered a city, took 4473000*l*. what was each man's share. *Answ.* 50*l*.

2. A gentleman agreed to give 200*l*. for a certain piece of work; now if 40 men are employed, what is each man's share? *Answ.* 5*l*.

3. Suppose I lease 780 square yards of land to build upon, the front of which is twenty yards, how many yards in depth must be fenced out to make up the exact compliment of square yards? *Answ.* 39 yards.

4. A general hath 31624 soldiers in the field, now suppose he placeth 268 in the rank, how many will there be in the file. *Answ.* 118 men.

5. In

Compound Addition.

15

5. In a printed book there are 528750 letters, each line of which contains 50 letters, and each page 45 lines; how many pages are there in the book? *Answ.* 235.

6. In a certain town there are 50000 persons and every house on an average contains five persons, how many houses are there in the town? *Answ.* 10000.

7. What number added to 20 times 100 will give the square of 50? *Answ.* 500.

COMPOUND ADDITION,

IS the adding several sums or numbers together, having divers denominations.

ARITHMETICAL TABLES.

PENCE TABLES,

s.	d.
1	is 12
2	— 24
3	— 36
4	— 48
5	— 60
6	— 72
7	— 84
8	— 96
9	— 108
10	— 120
11	— 132
12	— 144
13	— 156
14	— 168
15	— 180
16	— 192
17	— 204 Pistole
18	— 216
19	— 228
20	— 240 Pound
21	— 252 Guinea
27	— 324 Moidore

d.	s.	d.
20	is 1	8
30	— 2	6 Half a crown
40	— 3	4
50	— 4	2
60	— 5	0 Crown
70	— 5	10
80	— 6	8 Noble
90	— 7	6
100	— 8	4
110	— 9	2
120	— 10	0 Angel
130	— 10	10
140	— 11	8
150	— 12	6
160	— 13	4 Mark
170	— 14	2
180	— 15	0
190	— 15	10
200	— 16	8
210	— 17	6
220	— 18	4
240	— 20	0 Pound

4 farthings make 1 penny d. $\frac{1}{4}$
 12 pence — 1 shilling s. $\frac{1}{2}$
 20 shillings — 1 pound l. $\frac{1}{20}$

is wrote for { 1 qr.
 2 qrs.
 3 qrs.
 TROY

C 2

TROY WEIGHT.

- 24 grains gr. make one penny-weight, *dwt.*
 20 Pennyweights 1 ounce, *oz.*
 12 Ounces 1 pound, *lb.*

AVOIRDUPOISE WEIGHT.

- 16 Drams *dr.* make 1 ounce *oz.*
 16 Ounces 1 pound *lb.*
 28 Pounds 1 quar. of cwt. *qr.*
 4 Quarters 1 hundred, *cwt.*
 20 Hundred 1 ton, *T.*

- 14 Pounds 1 stone
 4 Stone 1 truss of old hay
 8 Pound of butcher's meat 1 stone
 19½ Hundreds 1 fother of lead

APOTHECARIES WEIGHT.

- 20 Grains, *grs.* make 1 scruple, *ʒ*
 3 Scruples one dram, *ʒ*
 ʒ Drams 1 ounce, *ʒ*
 12 Ounces 1 pound, *lb.*

WOOL WEIGHT.

- 7 Pounds make 1 clove
 2 Cloves 1 stone
 2 Stones 1 todd
 6½ Todds 1 wey
 2 Weyes 1 sack
 12 Sacks 1 last
 7 Tood in some places make one wey, and 240 pounds one pack.

CLOTH MEASURE.

- 2½ Inches make 1 nail
 4 Nails 1 quarter of a yard
 3 Quarters 1 ell Flemish
 4 Quarters 1 yard
 5 Quarters 1 ell English
 6 Quarters 1 ell French

LAND MEASURE.

- 7 Inches 92 parts make 1 link
 25 Links 1 pole
 5½ Yards 1 perch, rod, or pole
 40 Poles 1 rood
 4 Roods 1 acre
 30 Acres 1 yard of land
 100 Acres 1 hide of land

WINE MEASURE.

- 4 Gills make 1 pint
 2 Pints 1 quart
 2 Quarts 1 pottle
 4 Quarts 1 gallon
 10 Gallons 1 anker of brandy or rum
 18 Gallons 1 runlet
 31½ Gallons 1 barrel
 42 gallons 1 tierce
 2 Tierce 1 puncheon
 63 Gallons 1 hogshead
 2 Hogsheads 1 pipe or butt
 2 Pipes, 252 gallons 1 ton.

LONG MEASURE.

- 3 Barley measures, *b. c.* make 1 inch, *in.*
 12 Inches 1 foot, *f.*
 3 Feet 1 yard, *yd.*
 5 Feet 1 pace
 2 Yards 1 fathom
 5½ Yards 1 pole, rod, or perch
 22 Yards 4 poles
 4 Poles, or 100 links 1 chain
 40 Poles, or 10 chains 1 furlong
 8 Furlongs, or 1760 yards 1 mile
 3 Miles 1 league
 23½ Leagues, or 69½ miles 1 degree
 360 Degrees 1 circumference
 4 Inches

- 4 Inches 1 hand
 4 Inches 1 span
 2 Spans 1 cubit
 2 Cubits 1 yard
 2030 Yards 1 geographical mile
 1 French toise 6 French feet
 18 English feet 1 pole in the fens
 21 Feet 1 pole in the forest

ALE and BEER MEASURE.

- 2 Pints make 1 quart
 4 Quarts 1 gallon
 8 Gallons 1 firkin of ale
 9 Gallons 1 firkin of beer
 2 Firkins or 16 gals. 1 kilderkin, or half bar. of ale
 2 Firkins or 18 gals. 1 kilderkin, or half bar. of beer
 32 Gallons 1 barrel of ale
 36 Gallons 1 barrel of beer
 48 Gallons 1 hogshead of ale
 54 Gallons 1 hogshead of beer
 2 Hhds. or 96 gallons 1 butt of ale
 2 Hhds. or 100 gallons 1 butt of beer.

Note. This difference betwixt ale and beer measure, is now only used in London; but in all other places in England the general standard table of beer and ale, whether it be strong or small, is to be observed according to a statute of excise made in the year 1689, for gauging and selling.

General Standard in the Country.

- 282 Cubic inches 1 gallon
 8½ Gallons 1 firkin

- 17 Gallons 1 kilderkin
 34 Gallons 1 barrel
 51 Gallons 1 hhd. of beer or ale.

Note. Common brewers in the country allow 36 gallons to the publicans for a barrel of beer or ale.

DRY MEASURE.

- 2 Pints make 1 quart
 2 Quarts 1 pottle
 2 Pottles or 8 pints 1 gallon
 2 Gallons or 16 pints 1 peck
 4 Pecks 1 bushel
 4 Bushels 1 comb
 2 Combs, or 8 bushels 1 quarter or seam
 5 Quarters, or 40 bushels 1 load
 2 Loads 1 wey
 12 Weys 1 last.

For Coals.

- 4 Pecks 1 bushel
 3 Bushels 1 sack
 9 Bushels 1 quarter of a chaldron
 4 Quarters, or 36 bushels 1 chaldron
 21 Chaldrons 1 score of coals

Also,

- 4 Quarters, or 32 bushels make 1 chaldron in the country
 5 Pecks 1 bushel water measure
 5 Bushels 1 sack of flour

TIME.

- 60 Thirds make 1 second
 60 Seconds 1 minute
 60 Minutes 1 hour

24 Hours

24 Hours 1 day
 7 Days 1 week
 4 Weeks 1 month
 13 Months, 1 day, 6 hours, 1
 Julian year
 365 Days, 5 hours, 48 min.
 55 sec. 1 solar year.

MOTION.

60 Seconds " make 1 minute
 60 Minutes 1 degree °.
 30 Degrees 1 sign
 12 Signs, or 360 degrees, 1
 great circle of the zodiac.

SQUARE MEASURE.

144 Inches make 1 foot
 9 Feet 1 yard
 27 $2\frac{1}{4}$ Feet 1 rod of brick work
 30 $\frac{1}{4}$ Yards 1 pole
 16 Poles 1 chain
 40 Poles 1 rood
 10 Chains 1 acre
 4 Roods 1 acre
 160 Poles 1 acre
 4840 Yards 1 acre
 640 Acres 1 mile.

SOLID MEASURE.

1728 Inches make 1 foot
 27 Feet 1 yard or load
 40 Feet of unhewn timber 1
 ton or load
 50 Feet of hewn timber 1 ton
 or load
 231 Inches one wine gallon
 282 Inches 1 ale or beer gal-
 lon
 268 $\frac{4}{3}$ Inches 1 corn gallon
 2150.42 Inches 1 standard
 bushel

HEBREW COIN.

A silver menah (weight sixty
 shekels) 7l. 1s. 5 $\frac{1}{4}$ d.
 Talent of silver (weight 300
 shekels) 357l. 11s. 10 $\frac{1}{2}$ d.
 Talent of gold (same weight)
 3075l. 15s. 7 $\frac{1}{2}$ d.
 Gold dram (mentioned Ezek.
 ii. 19.) 1l. 0s. 4d.

EXAMPLES of MONEY. (Page 22.)

(1)

£.	s.	d.
23	6	8 $\frac{1}{4}$
42	4	2
51	2	6 $\frac{1}{2}$
18	5	3
41	8	7 $\frac{1}{2}$
36	7	4
58	9	3 $\frac{1}{4}$
22	6	2
31	2	6 $\frac{1}{4}$

(2)

£.	s.	d.
41	12	4 $\frac{1}{2}$
32	10	6
61	13	8 $\frac{1}{4}$
12	10	6
18	12	8 $\frac{1}{4}$
48	16	2
21	14	3 $\frac{1}{4}$
64	19	6
51	10	3 $\frac{1}{4}$

Compound Addition.

19

(3)

£.	s.	d.
436	12	4 $\frac{1}{4}$
214	10	2
421	12	3
604	13	6
346	14	8 $\frac{1}{2}$
123	16	6
531	10	4 $\frac{1}{4}$
678	12	3
210	10	7
142	12	6 $\frac{1}{4}$
234	13	4
346	14	3 $\frac{1}{4}$
214	15	6
761	12	4
421	16	6 $\frac{1}{2}$
500	10	0
231	11	3
364	14	8 $\frac{1}{4}$
235	12	4
642	18	8 $\frac{1}{4}$

(4)

£.	s.	d.
326	10	6 $\frac{1}{2}$
123	12	3
210	14	8
102	12	4 $\frac{1}{2}$
412	16	8
345	18	2
684	10	3 $\frac{1}{4}$
412	12	4
123	16	2
216	10	0
168	14	4
213	16	4
486	12	2
100	0	4 $\frac{1}{2}$
516	10	2
874	18	3
141	16	1 $\frac{1}{4}$
142	11	2
510	15	5
345	12	4 $\frac{1}{2}$

(5)

£.	s.	d.
123	10	6
401	12	2
345	13	4 $\frac{1}{4}$
148	10	1
400	10	0
345	16	4
510	11	6
601	10	4 $\frac{1}{2}$
12	12	6
100	16	4
231	14	8
364	18	6 $\frac{1}{2}$
340	12	2
104	14	3
421	18	9
602	11	0 $\frac{1}{4}$
708	14	1
164	12	2
314	10	3
231	18	6 $\frac{1}{4}$

(6)

£.	s.	d.
486	13	4 $\frac{1}{2}$
214	12	3
123	14	8
231	11	8
414	10	2 $\frac{1}{4}$
324	10	4
678	18	8
421	16	6
204	12	4 $\frac{1}{2}$
542	16	6
607	17	6
142	12	7 $\frac{1}{2}$
241	10	2
672	13	3
214	18	9
631	16	0 $\frac{1}{4}$
123	11	1
200	18	2
425	15	6
310	19	8 $\frac{1}{2}$

(7)

£.	s.	d.
345	16	4 $\frac{1}{4}$
221	13	3
412	12	1 $\frac{1}{2}$
121	13	1
234	11	6 $\frac{1}{4}$
121	3	2
241	14	1 $\frac{1}{4}$
312	12	2
641	11	3 $\frac{1}{2}$
113	12	1
221	16	2 $\frac{1}{4}$
412	12	1
532	8	4 $\frac{1}{4}$
641	12	2
212	13	8 $\frac{1}{4}$
141	11	4
421	12	3 $\frac{1}{2}$
215	13	1
326	17	3 $\frac{1}{4}$
913	12	2 $\frac{1}{4}$

(8)

£.	s.	d.
467	16	2 $\frac{1}{4}$
122	13	4
141	12	2 $\frac{1}{2}$
246	7	1
152	11	3 $\frac{1}{4}$
361	12	2
121	11	4 $\frac{1}{2}$
214	11	6
303	12	2 $\frac{1}{4}$
417	12	1
521	8	8 $\frac{1}{4}$
601	11	1
134	16	7 $\frac{1}{4}$
145	12	2
216	13	1 $\frac{1}{4}$
313	14	3
427	11	2 $\frac{1}{2}$
452	12	4
236	15	6 $\frac{1}{2}$
423	14	2

Compound Addition.

(9)	£.	s.	d.
546	12		$4\frac{1}{4}$
421	12		2
132	13		$1\frac{1}{2}$
274	12		2
311	14		$3\frac{1}{4}$
114	11		4
240	4		$2\frac{1}{2}$
413	16		1
540	11		$5\frac{1}{4}$
124	12		3
312	15		$4\frac{1}{4}$
130	12		1
456	6		$1\frac{1}{4}$
622	12		2
214	18		$1\frac{1}{2}$
130	11		8
312	12		$1\frac{3}{4}$
160	14		7
321	12		$1\frac{1}{2}$
213	14		1

(10)	£.	s.	d.
346	12		$4\frac{1}{2}$
212	13		2
401	11		$1\frac{3}{4}$
630	13		$2\frac{1}{4}$
147	8		$1\frac{1}{4}$
122	12		4
232	12		$3\frac{1}{4}$
414	14		$1\frac{1}{4}$
103	12		8
368	10		$4\frac{1}{2}$
431	6		$6\frac{1}{2}$
207	15		1
140	14		$4\frac{1}{4}$
243	18		2
616	14		$2\frac{1}{4}$
472	10		$6\frac{1}{2}$
204	10		2
212	14		$1\frac{1}{4}$
161	13		7
342	12		$2\frac{1}{4}$

(11)	£.	s.	d.
238	13		$3\frac{1}{4}$
121	14		2
149	12		$1\frac{1}{2}$
220	10		2
314	6		$1\frac{1}{4}$
621	12		4
143	11		$1\frac{3}{4}$
201	10		4
406	10		$6\frac{1}{4}$
242	14		2
314	12		$1\frac{1}{4}$
726	3		7
120	10		$2\frac{3}{4}$
160	10		8
804	11		$1\frac{1}{4}$
125	14		9
543	11		$6\frac{1}{4}$
412	12		$3\frac{1}{4}$
612	10		5
342	11		$4\frac{1}{4}$

(12)	£.	s.	d.
146	12		$4\frac{1}{4}$
310	16		2
426	12		4
500	18		6
294	19		$9\frac{1}{4}$
567	18		8
890	17		2
123	14		4
456	15		$1\frac{1}{2}$
789	10		0
100	10		1
234	11		2
356	12		$3\frac{1}{4}$
780	13		6
918	12		4
765	14		5
204	15		$6\frac{1}{2}$
310	12		7
617	17		6
123	12		$3\frac{1}{4}$

Compound Addition.

21

TROY WEIGHT.

lb.	oz.	dwt.	gr.
(13) 45	8	12	20
11	4	14	7
43	2	10	3
21	1	16	4
8	3	2	2
14	4	1	14
21	1	10	3
11	10	2	1
34	4	3	8
12	5	2	10
44	3	12	6
34	10	3	12
21	3	12	17
2	2	8	1
14	1	1	5
43	2	6	4
1	4	10	12
44	10	1	10
33	1	4	3
23	3	6	2

lb.	oz.	dwt.	gr.
(14) 45	6	10	18
13	2	8	4
22	1	1	3
0	4	3	1
21	2	5	4
32	3	6	6
21	10	2	1
1	3	10	4
23	5	3	4
45	2	6	10
21	1	10	3
35	2	4	5
4	1	3	16
35	3	1	2
16	10	4	3
21	4	1	10
11	2	3	10
5	10	1	2
12	0	6	6
24	1	3	5

APOTHECARIES WEIGHT.

lb.	oz.	dr.	sc.	gr.
(15) 2	10	7	2	16
4	3	2	1	2
1	2	1	1	4
0	1	3	2	10
3	2	2	1	3
2	4	1	1	1
3	10	2	1	15
1	3	5	2	2
6	4	4	1	4
3	6	2	2	6
1	11	3	1	14
1	1	4	2	3
2	4	5	1	4
7	2	4	1	6
2	6	3	2	4
1	10	2	1	10
8	2	1	1	3
6	4	3	2	5
1	3	5	1	3
6	2	4	1	2

lb.	oz.	dr.	sc.	gr.
(16) 5	8	6	2	17
3	1	1	1	1
4	10	2	1	6
4	3	4	2	2
3	2	1	1	1
5	1	2	1	16
6	2	2	1	2
0	10	3	2	11
6	3	4	1	2
4	5	2	2	2
2	10	1	1	3
3	2	6	2	5
0	1	1	1	3
3	5	1	1	1
2	6	4	2	14
7	10	1	1	3
2	1	2	2	10
2	4	1	1	6
5	5	4	1	12
2	1	6	1	18

Compound Addition.

AVOIRDUPOISE WEIGHT.

T. C. gr. lb. oz. dr.					
(17)	6	16	3	26	12 13
	4	2	2	1	6 5
	6	3	1	4	4 6
	2	10	1	10	8 10
	3	5	2	2	2 2
	1	1	3	1	1 12
	5	2	3	4	4 3
	4	4	2	6	8 4
	2	2	1	16	7 7
	3	10	2	11	2 1
	1	16	1	10	6 6
	2	4	1	2	7 1
	3	6	1	3	5 2
	2	4	2	4	1 4
	1	14	1	6	10 3
	3	2	1	2	12 2
	6	6	3	1	3 8
	4	2	2	4	4 1
	3	4	1	2	2 6
	2	3	3	2	4 3

(Page 23)

T. C. gr. lb. oz. dr.					
(18)	4	16	3	21	14 12
	5	3	1	6	3 4
	6	8	2	12	4 2
	3	15	1	10	2 11
	7	2	2	8	1 12
	1	4	1	6	1 3
	1	2	2	7	2 4
	4	4	1	1	1 2
	2	1	2	2	8 4
	3	10	3	6	7 13
	7	4	1	2	1 2
	2	2	2	5	1 2
	8	4	1	4	4 4
	1	5	2	4	3 5
	3	2	3	2	2 1
	1	6	1	3	4 10
	1	2	2	8	5 8
	4	3	1	1	6 10
	5	4	3	4	1 5
	4	2	2	5	2 3

CLOTH MEASURE.

Yds. gr. na.		
(19)	24	3 2
	13	1 3
	24	2 1
	12	1 2
	33	1 1
	42	1 2
	16	2 1
	42	3 1
	51	2 2
	13	1 1
	24	1 2
	16	1 1
	1	3 3
	87	2 1
	14	1 2
	72	2 1
	23	1 1
	4	2 3
	54	3 3
	42	3 3

E. Ells. gr. na.		
(20)	35	3 3
	24	4 1
	16	2 1
	40	1 1
	52	2 2
	21	1 1
	47	2 2
	61	2 1
	4	1 1
	16	4 2
	44	1 2
	21	3 1
	22	1 2
	3	1 1
	65	3 1
	12	4 2
	38	1 0
	42	3 1
	14	4 1
	35	2 1

F. Ells. gr. na.		
(21)	45	2 3
	21	1 1
	23	0 1
	14	1 1
	26	2 2
	31	0 1
	42	1 0
	30	1 2
	46	0 1
	87	2 3
	10	1 1
	72	1 0
	1	0 3
	80	1 0
	47	2 3
	61	1 1
	40	0 2
	36	1 3
	55	1 0
	42	0 2

LONG MEASURE.

Leag. mi. fur. po.

(Page 23.)

Yds. ft. in. b.c.

(22)	14	2	6	36
	21	1	1	8
	43	1	1	1
	21	0	1	27
	60	1	4	4
	21	2	3	5
	12	0	2	31
	71	1	5	23
	2	1	1	8
	20	0	2	1
	43	0	1	24
	24	1	3	21
	12	2	1	6
	21	0	2	21
	52	1	4	8
	30	2	5	10
	15	1	0	36
	60	1	1	8
	21	0	0	4
	13	1	2	15

(23)	41	2	8	2
	14	1	1	1
	31	0	4	0
	42	1	1	1
	61	2	2	2
	43	1	1	1
	4	1	1	0
	12	0	6	1
	4	1	3	1
	12	1	7	0
	22	0	2	1
	21	2	6	2
	65	1	2	0
	13	0	1	1
	46	1	4	1
	63	0	5	2
	51	1	3	0
	34	0	1	1
	81	2	2	0
	24	1	3	1

LAND MEASURE.

A.	R.	P.
(24)	45	3 18
	34	2 27
	16	1 8
	12	1 4
	61	1 6
	20	1 27
	14	0 4
	40	2 5
	21	1 32
	13	0 4
	31	1 6
	60	0 3
	21	3 20
	43	1 6
	30	3 20
	12	0 31
	10	1 3
	61	0 1
	20	2 23
	12	2 4

A.	R.	P.
(25)	56	2 36
	12	1 8
	31	0 10
	45	1 4
	54	2 3
	68	1 20
	21	2 6
	17	1 3
	2	0 30
	41	3 4
	13	2 11
	43	1 8
	1	2 4
	31	3 6
	16	0 27
	23	1 8
	4	2 4
	35	0 6
	64	2 21
	35	1 6

A.	R.	P.
(26)	23	1 20
	31	2 31
	12	3 3
	31	1 4
	2	2 5
	47	1 34
	22	0 2
	30	2 12
	48	1 3
	20	1 8
	31	3 4
	14	1 24
	31	1 4
	23	2 8
	31	1 21
	44	0 3
	31	1 21
	76	2 4
	48	1 8
	89	3 16

Compound Addition.

WINE MEASURE.

T. hhd. gal. qt. pi.

(Page 23.)

T. hhd. gal. qt. pi.

(27)

4	3	45	3	1
1	1	6	1	0
2	2	2	2	1
2	3	4	2	1
6	1	24	1	0
7	1	6	0	1
8	2	3	1	1
1	0	42	2	1
4	1	4	0	0
2	2	6	3	0
7	0	2	2	1
8	2	12	1	1
6	0	23	3	1
1	1	4	0	1
7	2	6	2	1
4	1	30	1	1
2	1	4	3	1
6	0	8	3	0
7	2	21	3	1
4	2	36	3	1

(28)

6	2	36	3	1
4	1	4	1	0
1	1	5	0	1
1	2	31	2	1
5	3	5	1	0
9	0	6	2	1
1	1	21	3	0
3	2	41	1	1
1	3	3	2	0
8	1	4	1	1
7	2	2	2	1
6	0	1	1	0
1	1	2	0	1
6	1	10	1	0
9	1	41	2	1
7	2	22	0	1
1	1	8	1	0
4	0	10	2	1
3	1	41	0	0
5	2	4	2	1

ALE AND BEER MEASURE.

A. hhd. gal. qt. pi.

B. bb. gal. qt. pi.

(29)

23	27	3	1
62	6	1	0
21	3	2	1
53	24	0	1
41	3	1	0
32	7	2	1
71	20	1	1
31	40	2	0
12	2	1	1
21	5	3	1
31	34	2	0
13	6	1	1
21	2	0	0
12	10	2	1
30	7	1	1
11	2	0	1
20	21	2	0
61	6	1	1
10	31	0	0
1	5	2	1

(30)

23	23	3	1
11	4	1	1
21	36	0	0
12	6	2	1
51	3	1	0
11	40	2	1
42	5	1	1
31	30	0	0
41	6	3	1
52	27	2	1
23	8	1	1
10	4	2	1
41	26	0	0
32	4	3	0
41	3	1	1
71	40	0	1
0	4	1	0
61	20	2	1
21	31	1	0
12	22	1	1

Compound Addition.

25

DRY MEASURE.

(31)	L.	qr.	bu.	pec.	gal.
4	8	6	3	1	
2	7	5	2	0	
3	6	4	1	1	
5	5	3	0	1	
7	4	2	1	0	
1	3	1	2	1	
6	2	2	3	0	
8	1	0	0	1	
3	0	3	1	0	
2	2	1	2	1	
1	3	4	1	1	
7	5	2	0	0	
9	4	4	1	1	
1	7	3	2	1	
2	0	5	0	0	
4	1	6	1	1	
3	4	1	3	0	
2	2	0	2	0	
6	1	4	0	1	
3	4	2	2	1	

(Page 23.)

(32)	L.	qr.	bu.	pec.	gal.
8	7	6	3	1	
7	6	5	2	0	
6	5	4	1	1	
5	4	3	0	1	
4	3	2	3	1	
3	2	1	2	0	
2	1	6	1	1	
1	0	5	0	1	
9	1	4	3	1	
8	2	3	2	0	
7	1	2	1	1	
2	0	1	1	0	
6	2	0	0	1	
5	3	2	1	0	
4	4	3	2	1	
3	2	1	2	1	
2	5	4	3	0	
1	3	2	2	1	
2	6	5	2	0	
3	4	4	1	1	

TIME.

(33)	Years	mo.	av.	days
23	9	3	6	
46	8	2	5	
84	7	1	4	
72	6	0	3	
13	5	3	2	
20	4	2	1	
84	3	1	0	
16	2	0	5	
41	1	1	4	
23	0	1	3	
64	9	2	2	
12	8	2	1	
21	7	3	0	
14	5	3	4	
36	6	1	3	
74	4	2	2	
17	2	3	1	
63	3	0	2	
42	1	1	3	
21	6	2	4	

(34)	Days	ho.	mi.	sec.
46	9	54	48	
33	8	3	6	
21	7	12	5	
62	6	10	4	
74	5	4	37	
12	4	6	3	
31	3	7	2	
10	2	1	1	
42	1	14	26	
37	0	21	2	
62	9	3	3	
74	8	4	4	
13	7	21	5	
47	0	2	6	
62	6	4	27	
31	5	6	5	
89	1	8	4	
61	4	29	2	
20	3	2	6	
45	2	12	13	

* D

Compound Addition.

MOTION.

(Page 23.)

f.	p.	'	"	'''
(35) 9	4	21	46	21
8	5	3	7	2
7	6	4	8	3
6	7	5	9	4
5	8	6	22	5
4	9	31	3	32
3	8	2	4	3
2	7	3	5	4
1	2	4	6	5
9	6	5	18	6
8	5	42	7	43
7	4	3	6	7
6	3	4	5	8
5	2	5	4	9
4	1	6	2	10
3	2	12	1	4
2	3	7	6	3
8	4	4	7	2
4	5	2	4	21
3	6	5	3	6

f.	p.	'	"	'''
(36) 8	27	48	22	34
7	6	7	3	5
5	5	6	4	6
6	4	5	2	7
5	3	4	6	8
4	1	3	7	9
3	11	2	5	1
2	3	41	4	2
1	4	4	36	3
6	5	5	7	26
7	21	6	1	7
5	4	7	2	2
4	5	1	3	1
3	6	4	4	3
1	7	21	6	4
2	1	4	7	6
4	21	2	32	7
6	6	1	8	2
7	3	12	7	4
4	5	6	4	5

SQUARE MEASURE.

Yds.	ft.	inch
(37) 42	8	12
21	7	23
32	6	34
43	5	56
54	4	78
65	3	90
76	2	12
87	1	48
98	2	57
19	3	66
28	4	75
37	5	84
45	6	10
56	7	3
64	4	14
73	2	20
82	1	16
91	3	73
23	4	21
46	5	42

Yds.	ft.	inch
(38) 36	7	21
45	6	34
54	5	21
63	4	56
72	3	78
81	2	90
92	1	12
13	0	11
24	2	13
35	3	24
46	4	57
57	5	61
68	6	21
79	7	10
81	8	42
10	9	63
21	1	74
32	2	81
43	3	2
54	4	53

Compound Addition.

27

SOLID MEASURE.

Yds. ft. inch		
(39)	45	9 87
	64	8 31
	42	7 45
	31	6 32
	14	5 14
	20	4 21
	31	3 36
	74	2 42
	41	1 10
	45	6 2
	76	5 31
	81	7 45
	17	4 67
	41	3 84
	32	2 12
	10	4 41
	56	7 32
	74	1 56
	12	4 71
	46	3 12

(Page 23.)

Yds. ft. inch		
(40)	56	9 34
	78	7 56
	90	8 78
	12	4 19
	34	5 28
	56	6 76
	78	1 54
	90	2 32
	12	3 10
	23	4 1
	45	5 23
	67	6 45
	89	7 67
	10	8 81
	21	9 20
	30	1 34
	45	2 25
	67	3 10
	41	4 24
	23	5 32

APPLICATION. (Page 24.)

Quest. 1 A Tradesman received in cash of A. 27*l.* 1*s.* 4*d.* of B. 12*l.* 6*s.* 8½*d.* of C. 31*l.* 12*s.* 8*d.* of D. 42*l.* 14*s.* 8½*d.* of E. 82*l.* 4*s.* 2*d.* and F. 41*l.* 16*s.* 3½*d.* what was the sum received ?

Ans. £.237 15 10½

2. A Cornfactor pays for wheat 23*l.* 12*s.* 6*d.* for rye 16*l.* 4*s.* 2*d.* for oats 20*l.* 0*s.* 6*d.* for barley 38*l.* 14*s.* 6½*d.* he also paid for carriage 1*l.* 6*s.* now suppose his commission on the whole is 3*l.* 10*s.* 6*d.* how much must he draw for upon his employer to clear the account ?

Ans. £.103 8 2½

3. A owes such a sum of money, that if he paid thirty pounds ten shillings and six-pence; the remainder to pay will be forty-two pounds two shillings and four-pence; required the sum owed ?

Ans. £.72 12 10

4. A privateer took a Prize, the private men's share came to 394*l.* 12*s.* 6*d.* the officers received as much, besides 240*l.* unknown to the private men; how much did the officers receive ?

Ans. £.634 12 6

D 2

5. Bought

5. Bought a parcel of goods, whereof the first cost was 58*l.* paid for packing them half a guinea, for carriage a moi-dore, and spent about the bargain a noble; what do these goods stand me in? *Ans.* £.60 4 2

6. If the yearly rent of my house is 30*l.* per annum, window lights 18*s.* 10½*d.* poor's rates 10*l.* lamp and scavenger's levy two guineas, how much does the whole amount to per annum? *Ans.* 43*l.* 0*s.* 10½*d.*

COMPOUND SUBTRACTION,

Teacheth to find the difference between any two sums of divers denominations.

EXAMPLES of MONEY. (Page 24.)

(1)	From	£.	s.	d.
		86	18	6½
	Take	63	12	4½
		<hr/>		
	Remains	23	6	2¼
		<hr/>		
	Proof	86	18	6½
		<hr/>		

(2)	£.	s.	d.
	79	16	8½
	62	10	4½
	<hr/>		
	<hr/>		

(3)	£.	s.	d.
	56	19	9½
	41	12	4
	<hr/>		
	<hr/>		

(4)	£.	s.	d.
	43	10	4
	21	18	6½
	<hr/>		
	<hr/>		

(5)	£.	s.	d.
	87	19	8½
	46	10	4½
	<hr/>		
	<hr/>		

(6)	£.	s.	d.
	39	18	7½
	21	16	8½
	<hr/>		
	<hr/>		

(7)	£.	s.	d.
	47	10	2½
	29	12	4
	<hr/>		
	<hr/>		

(8)	£.	s.	d.
	68	16	8½
	41	18	2½
	<hr/>		
	<hr/>		

TROY WEIGHT.

(9)	lb.	oz.	dwt.	gr.
	86	10	18	21
		14	8	9 12
	<hr/>			
	<hr/>			

(Page 25)

(10)	lb.	oz.	dwt.	gr.
	67	9	16	18
		21	6	9 14
	<hr/>			
	<hr/>			

(11)

Compound Subtraction.

29

$$\begin{array}{r} \text{lb. oz. dwt. gr.} \\ (11) \quad 87 \quad 6 \quad 9 \quad 14 \\ \quad \quad 12 \quad 8 \quad 12 \quad 10 \\ \hline \end{array}$$

$$\begin{array}{r} \text{lb. oz. dwt. gr.} \\ (12) \quad 86 \quad 10 \quad 10 \quad 21 \\ \quad \quad 13 \quad 8 \quad 18 \quad 12 \\ \hline \end{array}$$

APOTHECARIES WEIGHT.

$$\begin{array}{r} \text{lb. oz. dr. sc. gr.} \\ (13) \quad 86 \quad 10 \quad 7 \quad 2 \quad 18 \\ \quad \quad 31 \quad 9 \quad 4 \quad 1 \quad 12 \\ \hline \end{array}$$

$$\begin{array}{r} \text{lb. oz. dr. sc. gr.} \\ (14) \quad 56 \quad 9 \quad 6 \quad 2 \quad 15 \\ \quad \quad 37 \quad 4 \quad 2 \quad 1 \quad 12 \\ \hline \end{array}$$

$$\begin{array}{r} \text{lb. oz. dr. sc. gr.} \\ (15) \quad 98 \quad 10 \quad 2 \quad 2 \quad 16 \\ \quad \quad 56 \quad 8 \quad 6 \quad 1 \quad 14 \\ \hline \end{array}$$

$$\begin{array}{r} \text{lb. oz. dr. sc. gr.} \\ (16) \quad 61 \quad 11 \quad 7 \quad 1 \quad 10 \\ \quad \quad 46 \quad 6 \quad 3 \quad 2 \quad 18 \\ \hline \end{array}$$

AVOIRDUPOISE WEIGHT.

$$\begin{array}{r} \text{T. C. gr. lb. oz. dr.} \\ (17) \quad 8 \quad 18 \quad 3 \quad 21 \quad 14 \quad 15 \\ \quad \quad 4 \quad 12 \quad 2 \quad 18 \quad 12 \quad 11 \\ \hline \end{array}$$

$$\begin{array}{r} \text{T. C. gr. lb. oz. dr.} \\ (18) \quad 9 \quad 16 \quad 1 \quad 21 \quad 12 \quad 8 \\ \quad \quad 5 \quad 18 \quad 3 \quad 16 \quad 11 \quad 4 \\ \hline \end{array}$$

$$\begin{array}{r} \text{T. C. gr. lb. oz. dr.} \\ (19) \quad 9 \quad 19 \quad 1 \quad 11 \quad 12 \quad 13 \\ \quad \quad 1 \quad 14 \quad 3 \quad 26 \quad 14 \quad 15 \\ \hline \end{array}$$

$$\begin{array}{r} \text{T. C. gr. lb. oz. dr.} \\ (20) \quad 10 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \\ \quad \quad 6 \quad 14 \quad 2 \quad 12 \quad 10 \quad 10 \\ \hline \end{array}$$

CLOTH MEASURE.

$$\begin{array}{r} \text{Yds. qr. na.} \\ (21) \quad 56 \quad 3 \quad 3 \\ \quad \quad 23 \quad 1 \quad 2 \\ \hline \end{array}$$

$$\begin{array}{r} \text{E. E. gr. na.} \\ (22) \quad 78 \quad 4 \quad 1 \\ \quad \quad 45 \quad 2 \quad 3 \\ \hline \end{array}$$

$$\begin{array}{r} \text{F. E. gr. na.} \\ (23) \quad 67 \quad 2 \quad 0 \\ \quad \quad 38 \quad 1 \quad 3 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Yds. qr. na.} \\ (24) \quad 76 \quad 3 \quad 0 \\ \quad \quad 51 \quad 0 \quad 3 \\ \hline \end{array}$$

$$\begin{array}{r} \text{E. E. gr. na.} \\ (25) \quad 32 \quad 4 \quad 1 \\ \quad \quad 17 \quad 3 \quad 3 \\ \hline \end{array}$$

$$\begin{array}{r} \text{F. E. gr. na.} \\ (26) \quad 43 \quad 2 \quad 1 \\ \quad \quad 40 \quad 1 \quad 3 \\ \hline \end{array}$$

D 3

LONG

Compound Subtraction.

LONG MEASURE.

$$\begin{array}{r} \text{Leag. mi. fur. po.} \\ (27) \quad 78 \quad 2 \quad 7 \quad 36 \\ \quad \quad 34 \quad 1 \quad 5 \quad 21 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Leag. mi. fur. po.} \\ (29) \quad 43 \quad 0 \quad 6 \quad 26 \\ \quad \quad 23 \quad 2 \quad 5 \quad 12 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Yds. ft. in. b.c.} \\ (28) \quad 89 \quad 2 \quad 10 \quad 2 \\ \quad \quad 56 \quad 1 \quad 8 \quad 1 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Yds. ft. in. b.c.} \\ (30) \quad 90 \quad 0 \quad 0 \quad 1 \\ \quad \quad 42 \quad 2 \quad 10 \quad 2 \\ \hline \end{array}$$

LAND MEASURE.

$$\begin{array}{r} \text{A. R. P.} \\ (31) \quad 78 \quad 3 \quad 38 \\ \quad \quad 12 \quad 1 \quad 21 \\ \hline \end{array}$$

$$\begin{array}{r} \text{A. R. P.} \\ (32) \quad 61 \quad 3 \quad 37 \\ \quad \quad 34 \quad 1 \quad 26 \\ \hline \end{array}$$

$$\begin{array}{r} \text{A. R. P.} \\ (33) \quad 54 \quad 2 \quad 21 \\ \quad \quad 24 \quad 3 \quad 39 \\ \hline \end{array}$$

$$\begin{array}{r} \text{A. R. P.} \\ (34) \quad 39 \quad 0 \quad 6 \\ \quad \quad 18 \quad 3 \quad 18 \\ \hline \end{array}$$

$$\begin{array}{r} \text{A. R. P.} \\ (35) \quad 65 \quad 2 \quad 10 \\ \quad \quad 46 \quad 3 \quad 39 \\ \hline \end{array}$$

$$\begin{array}{r} \text{A. R. P.} \\ (36) \quad 98 \quad 0 \quad 0 \\ \quad \quad 21 \quad 3 \quad 39 \\ \hline \end{array}$$

WINE MEASURE.

$$\begin{array}{r} \text{T. bhd. gal. qt. pi.} \\ (37) \quad 5 \quad 3 \quad 61 \quad 3 \quad 1 \\ \quad \quad 2 \quad 1 \quad 32 \quad 1 \quad 0 \\ \hline \end{array}$$

$$\begin{array}{r} \text{T. bhd. gal. qt. pi.} \\ (38) \quad 6 \quad 3 \quad 49 \quad 3 \quad 1 \\ \quad \quad 2 \quad 1 \quad 36 \quad 2 \quad 0 \\ \hline \end{array}$$

$$\begin{array}{r} \text{T. bhd. gal. qt. pi.} \\ (39) \quad 7 \quad 0 \quad 39 \quad 1 \quad 0 \\ \quad \quad 4 \quad 2 \quad 26 \quad 3 \quad 1 \\ \hline \end{array}$$

$$\begin{array}{r} \text{T. bhd. gal. qt. pi.} \\ (40) \quad 8 \quad 0 \quad 0 \quad 0 \quad 1 \\ \quad \quad 4 \quad 3 \quad 62 \quad 3 \quad 1 \\ \hline \end{array}$$

ALE AND BEER MEASURE.

$$\begin{array}{r} \text{A. bhd. gal. qt. pi.} \\ (41) \quad 76 \quad 46 \quad 0 \quad 1 \\ \quad \quad 65 \quad 21 \quad 3 \quad 0 \\ \hline \end{array}$$

(Page 26.)

$$\begin{array}{r} \text{B. bhd. gal. qt. pi.} \\ (42) \quad 89 \quad 49 \quad 3 \quad 1 \\ \quad \quad 61 \quad 21 \quad 0 \quad 0 \\ \hline \end{array}$$

31

	<i>B.</i>	<i>hhd.</i>	<i>gal.</i>	<i>qt.</i>	<i>pi.</i>
(44)	64	51	3	0	
	15	20	1	1	

	<i>Lasts</i>	<i>qr.</i>	<i>bu.</i>	<i>pec.</i>	<i>gal.</i>
(45)	6	4	6	3	1
	2	2	3	2	0

	<i>La</i>	<i>st</i>	<i>q</i>	<i>r</i>	<i>bu</i>	<i>pec</i>	<i>gal</i>
(46)	9	9	7	3	1		
	4	2	4	1	0		

	Lafts	qr.	bu.	pec.	gal.
(47)	8	9	2	1	0
	6	3	7	1	1

	<i>Lasts</i>	<i>qr</i>	<i>bu.</i>	<i>pec</i>	<i>gal.</i>
(48)	8	1	3	2	0
	4	9	1	3	1

	Years	mo.	w.	days.
(49)	86	9	3	6
	24	2	1	3

	Days	ho.	mi.	sec.
(50)	74	18	54	48
	31	10	21	32

Years mo. w. days.

(51)	48	0	1	6
	21	9	3	2

	Days	ho.	mi.	sec.
(52)	68	10	0	0
	23	20	40	35

S. O. ' ' "

(53) 9 24 36 48 9
4 20 21 18 4

(54) $\begin{array}{ccccc} S. & O. & ' & '' &''' \\ 8 & 27 & 48 & 22 & 34 \\ 4 & 12 & 21 & 12 & 58 \end{array}$

S. O. " III
(55) 5 26 18 44 56
2 12 51 10 21

(56) $\begin{array}{ccccc} S. & O. & J. & H. & M. \\ 9 & 8 & 20 & 10 & 4 \\ 4 & 21 & 46 & 32 & 56 \end{array}$

SQUARE

S Q U A R E M E A S U R E .

$$\begin{array}{r} \text{Yds. ft. inch} \\ (57) \quad 42 \quad 6 \quad 136 \\ \quad \quad 12 \quad 4 \quad 21 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Yds. ft. inch} \\ (58) \quad 89 \quad 8 \quad 121 \\ \quad \quad 22 \quad 4 \quad 48 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Yds. ft. inch} \\ (59) \quad 48 \quad 2 \quad 123 \\ \quad \quad 23 \quad 6 \quad 101 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Yds. ft. inch} \\ (60) \quad 65 \quad 7 \quad 24 \\ \quad \quad 32 \quad 1 \quad 32 \\ \hline \end{array}$$

S O L I D M E A S U R E .

$$\begin{array}{r} \text{Yds. ft. inch} \\ (61) \quad 3 \quad 25 \quad 1467 \\ \quad \quad 1 \quad 12 \quad 1934 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Yds. ft. inch} \\ (62) \quad 5 \quad 23 \quad 1684 \\ \quad \quad 3 \quad 12 \quad 1212 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Yds. ft. inch} \\ (63) \quad 6 \quad 24 \quad 1686 \\ \quad \quad 2 \quad 18 \quad 1028 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Yds. ft. inch} \\ (64) \quad 8 \quad 0 \quad 0000 \\ \quad \quad 2 \quad 24 \quad 1716 \\ \hline \end{array}$$

APPLICATION (Page 27).

Quest. 1. What is the difference between 86*l.* 0*s.* 6 $\frac{1}{4}$ *d.* and 31*l.* 18*s.* 11*d.*

Answ. £. 54 1 7 $\frac{3}{4}$

2. B lends C 200*l.* how much is C in his debt after B has taken goods of him to the amount of 84*l.* 6*s.* 4*d.*

Answ. £. 115 13 8

3. What is the difference between 18308 and the sum of 1508 added to 610?

Answ. 16190.

4. A Gentleman built a house and furnished it for 1100*l.* 8*s.* 4 $\frac{1}{2}$ *d.* the house cost 742*l.* 10*s.* 6*d.* what did the furniture stand him in?

Answ. £. 357 17 10 $\frac{1}{2}$

5. An apprentice is to serve his master till he is twenty-one years of age, who is 14 years, 12 months, 11 weeks, 10 days, 9 hours, and 8 minutes old, how long has he to serve?

Answ. 5 yrs. 10 mo. 3 w. 3 d. 14 h. 52 mi.

6. A

6. A trader failing was indebted to A 86*l* 10*s* 6*d*, to B 36*l*, to C 20*l* 12*s* 4½*d*, to D 56*l* 18*s*, to E 10*l* 10*s* 3*d*, and to F 86*l* 8*s* 6*d*. At the time of this disaster he had by him in cash 10*l*, in commodities 21*l* 12*s*, in household furniture 42*l* 0*s* 6*d*, in recoverable book debts 62*l* 13*s* 6*d*, in plate 12*l* 4*s* 4*d*, supposing these things are all surrendered to his creditors, what will they then lose by him ?

Ans. £. 148 9 3½

COMPOUND MULTIPLICATION.

RULE :—Multiply the price of one by the quantity given, the product is the answer.

2. If the given quantity is above 12, multiply by any two numbers, which multiplied together will make the same number.

3. If no two numbers multiplied together will make the exact number, find the nearest to it, either greater or less, which can be so produced ; then, after multiplying by the component parts as before, to or from the last product, add or subtract the produce of as many as it is less or greater than the given number, and it will give the answer required.

EXAMPLES. (Page 28—40)

1. If 1 yard of silk cost 16*s*. 4*d*. what will three yards cost ?

s.	d.	
16	4	
	3	
<hr/>		
£. 2	9	0 Answer

2. If 1 yard of drugget cost 7*s* 3*d* what will 4 yards cost ?

Ans. £. 1 9 0

3. What will 5 ells of dowlas come to at 1*s* 2*d* per ell ?

Ans. £. 0 5 10

4. What will 6 pounds of raisins come to at 7½*d* per pound ?

Ans. £. 0 3 9

5. If 1 pound of green tea cost 9*s* 6*d* what will 7 pounds cost ?

Ans. £. 3 6 6

6.

6. If 1 yard of ribbon cost 2s. 4d. what will 8 yards of the same cost? Ans. £. 0 18 8
7. Suppose 1 solid foot of timber cost me 1s. 9d. what will 9 cost? Ans. £. 0 15 9
8. What must be given for ten pounds of tobacco at 2s. 2½d. per pound? Ans. £. 1 2 1
9. How much will 11 hundred weight of sugar come to at 2l. 1s. 4d. per hundred weight? Ans. £. 22 14 8
10. If 1 quarter of oats cost 1l. 4s. 3d. what must be paid for 12 quarters? Ans. £. 14 11 0
11. What will 14 pounds of indigo come to at 17s. 6d. per pound? Ans. £. 12 5 0
12. Suppose I pay 7s. 10½d. for 1 pound of tea, how much will 15 pounds cost at that rate? Ans. £. 5 18 1½
13. If 1 moidore be worth 1l. 7s. sterling, what is the value of 16 moidores? Ans. £. 21 12 0
14. If 1 pistole is worth 17s. 6d. sterling, how many pounds must I pay for 18? Ans. £. 15 15 0
15. What will 20 hundred weight of cheese come to at 1l. 18s. 8d. per hundred weight? Ans. £. 38 13 4
16. What will 21 ells of Holland come to at 5s. 7½d. per ell? Ans. £. 5 18 1½
17. What will 22 hundred weight of tobacco come to at 5l. 11s. 4d. per hundred weight? Ans. £. 122 9 4
18. If 1 hundred weight of hops cost 4l. 7s. 2d. what will 24 hundred weight cost? Ans. 104 12 0
19. If 1 pair of stockings cost 4s. 6d. what will 25 pair cost? Ans. £. 5 12 6
20. What will 27 pair of silk gloves come to at 5s. 11½d. per pair? Ans. £. 8 0 10½
21. What will 28 dozen of lemons come to at 2s. 8d. per dozen? Ans. £. 3 14 8
22. How much will 30 hundred weight of hemp come to at 1l. 12s. per hundred weight? Ans. £. 48 0 0
23. How much will 32 yards of shalloon cost at 1s. 9d. per yard? Ans. 2 16 0
24. What will 33 tons of hay come to at 1l. 2s. per ton? Ans. £. 36 6 0
25. If 1 yard of broad cloth cost 1l. 2s. 6d. what will 35 yards cost? Ans. £. 39 7 6
26. If 1 gallon of oil cost 6s. 2½d. what will 36 gallons cost? Ans. £. 11 3 6

27. How much must be paid for 40 firkins of butter, at 1*l.* 12*s.* 6*d.* per firkin? Ans. £.65 0 0
28. What will 42 Gloucester cheefes come to at 6*s.* 4½*d.* each? Ans. £.13 7 9
29. What will 44 gallons cost at 19*s.* 10*d.* per gallon? Ans. £.43 12 8
30. Bought 45 yards of superfine broad cloth at 19*s.* 4*d.* per yard, what did the whole lie me in? Ans. £.43 10 0
31. If 1 yard of German serge cost 3*s.* 7*d.* what will 48 yards cost? Ans. £.8 12 0
32. If 1 yard of Irish cloth cost 2*s.* 5½*d.* what will 50 yards cost? Ans. £.6 2 11
33. What will 54 chaldrons of coals come to at 1*l.* 16*s.* 6*d.* per chaldron? Ans. £.98 11 0
34. What must be given for 55 tons of coals if 1 ton cost 1*l.* 10*s.* Ans. £.82 10 0
35. How much will 56 quarters of barley come to at 1*l.* 2*s.* 6*d.* per quarter? Ans. £.63 0 0
36. How much will 60 bushels of wheat cost at the rate of 6*s.* 9*d.* per bushel? Ans. £.20 5 0
37. If 1 bushel of oats cost 4*s.* 3*d.* what will 63 bushels cost? Ans. £.13 7 9
38. What will 64 bushels of beans come to at 4*s.* 8*d.* per bushel? Ans. £.14 18 8
39. What will 66 pounds of hops come to at 1*s.* 6½*d.* per pound? Ans. £.5 1 9
40. What will 70 hundred weight of hay come to at 1*s.* 4*d.* per hundred weight? Ans. £.4 13 4
41. If a gallon of ale cost 1*s.* 8*d.* how much must be paid for 72 gallons? Ans. £.6 0 0
42. If 1 gross of buttons cost 3*s.* 2¼*d.* how much will 77 gross cost? Ans. £.12 5 5½
43. What cost 80 barrels of oysters at 3*s.* 6*d.* per barrel? Ans. £.14 0 0
44. What will 81 yards of painting come to at 7½*d.* per yard? Ans. £.2 10 7½
45. How much will 84 hogsheads of tobacco come to at 21*l.* 4*s.* 6*d.* per hoghead? Ans. £.1782 18 0
46. What will 88 hundred weight of fustic come to at the rate of 4*s.* 6*d.* per hundred weight? Ans. £.19 16 0
47. What will 90 reams of paper cost at 6*s.* per ream? Ans. £.27 0 0

48. If 1 piece of lawn cost 2/ 10s what will 96 pieces cost? Ans. £.240 0 0
49. If 1 piece of Yorkshire cloth cost 8/ 10s what will 99 pieces cost? Ans. £.841 10 0
50. What will 100 stone of wool come to at 17s per stone? Ans. £.85 0 0
51. What will 108 dozen of Banbury locks come to at 5s 6d per dozen? Ans. £.29 14 0
52. What will 110 dozen of knives and forks come to at 1s 10d per dozen? Ans. £. 10 1 8
53. What will 120 slide-rules come to at 2s 8d. each? Ans. £.16 0 0
54. What will 121 Gunter's scales come to at 1s 2d each? Ans. £.7 1 2
55. What will 132 dozen of black lead pencils come to at 2s 4d per dozen? Ans. £.15 8 0
56. What will 144 brass locks come to at 2s 2d each? Ans. £.15 12 0
57. If 1 pound of cheese cost 4½d how much will 1 hundred weight cost? Ans. £.1 19 8
58. If 1 pound of iron cost 3½d how much must be paid for 2 hundred weight? Ans. £.3 5 4
59. What will 3 hundred weight of cheese come to at 5½d per pound? Ans. £.7 14 0
60. If 1 ounce of silver cost 5s 4d what will 360 ounces cost? Ans. £.96 0 0
61. What will 560 ounces of green verditure cost at 1s 4d per ounce? Ans. £.37 6 8
62. How much must I pay per annum for 1728 acres of land, at the rate of 1/ 2s 2d per acre? Ans. £. 1915 4 0
63. What will 17 crewet frames come to at 5s 8d each? Ans. £.4 13 6
64. What will 23 dozen of bone knives and forks come to at 3s 6d. per dozen? Ans. £.4 0 6
65. What will 29 dozen of pen knives come to at 14s 6d per dozen? Ans. £.21 0 6
66. How much will 34 pair of brass candlesticks come to at 3s 6d per pair? Ans. £.5 19 0
67. What will 37 pair of iron candlesticks come to at 9d per pair? Ans. £.1 7 9
68. What will 43 pair of buckles come to at 2s 2d per pair? Ans. £.4 13 2
- 69.

69. What will 39 pounds of tea come to at 12s. 6½d. per pound? Ans. £. 24 9 1½
70. If 1 yard of diaper cost 1s. 6½d. what will 47 yards cost? Ans. £. 3 12 5½
71. If 1 pair of snuffers cost 9d. what will 53 pair cost? Ans. £. 1 19 9
72. What will 59 scale-beams come to at 6s. 6d. each? Ans. £. 19 3 6
73. How much must be paid for 71 gold balances at 1s. 8d. each? Ans. £. 5 18 4
74. If 1 dozen of gilt buttons cost 4s. 8d. what will 83 dozen cost? Ans. £. 19 7 4
75. What will 89 tons of coals come to at 6s. 8d. per ton? Ans. £. 29 13 4
76. If 1 dozen of soap cost 6s. 8d. what will 97 dozen cost? Ans. £. 32 6 8
77. If 1 dozen of London spelling books cost 8s. 2d. what will 106 dozen cost? Ans. £. 43 5 8
78. What will 109 pair of silk stockings come to at 10s. 2d. per pair? Ans. 55 8 2
79. What will 123 dozen of candles come to at 5s. 6½d. per dozen? Ans. £. 34 1 7½
80. What will 145 hundred weight of raisins come to at 1l. 3s. 2d. per hundred weight? Ans. £. 167l. 19 2
81. If 1 pound of sugar cost 9d. what will 25½ pounds cost? Ans. £. 0 18 11½
82. If 1 pound of tobacco cost 2s. 4½d. what will 30½ pounds cost? Ans. £. 3 12 5½
83. How much must be paid for 35¼ barrels of ale, if 1 barrel cost 1l. 10s. 6d. Ans. £. 54 10 4½
84. How much will 40½ acres of land come to at 32l. 2s. 6d. per acre? Ans. £. 1301 1 3
85. What will 64¼ tons of hay come to at 2l. 12s. per ton? Ans. £. 167 1 0
86. What will 81½ yards of broad cloth come to at 1l. 4s. per yard? Ans. £. 97 16 0
87. If 1 pound of feathers cost 2s. 4d. how much will a feather bed come to that weighs 108½ pounds? Ans. £. 12 12 7
88. What will 120½ ells of holland come to at 6s. 8½d. per ell? Ans. £. 40 8 4½

89. Suppose I buy deal at $1s\ 4d$ per foot, what will $132\frac{1}{2}$ feet lie me in? Ans. £. 8 16 4

90. What will $144\frac{1}{2}$ gallons of British brandy come to at $9s\ 2d$ per gallon? Ans. £. 66 4 7

91. How much must be paid for $117\frac{1}{4}$ yards of cloth at the rate of $1l\ 5s\ 6d$ per yard? Ans. 149 9 10 $\frac{1}{2}$

92. What must be paid for $145\frac{1}{2}$ gallons of French brandy, when the price of one gallon is $12s\ 9\frac{1}{2}d$? Ans. £. 93 1 2 $\frac{1}{4}$

93. If 1 acre of land cost $60l\ 2s\ 4\frac{1}{2}d$, what will $1447\frac{1}{2}$ acres cost? Ans. £. 86661 3 6 $\frac{1}{4}$

94. What will $1729\frac{3}{4}$ solid feet of marble cost at the rate of $1l\ 5s\ 3d$ per solid foot? Ans. £. 2183 16 2 $\frac{1}{4}$

95. What will a year's salary amount to at the rate of $1l\ 4s\ 10\frac{1}{4}d$ per day? Ans. £. 453 11 9 $\frac{1}{4}$

96. Suppose a person in trade can clear $362l\ 10s\ 6\frac{1}{2}d$ a year, how much will he clear in $13\frac{1}{2}$ year's trading? Ans. £. 4894 2 3 $\frac{1}{4}$

97. If the cloathing of 1 soldier cost $4l\ 4s\ 3\frac{1}{4}d$ what will the cloathing of an army, consisting of 9652 men, cost government? Ans. £. 40669 2 1

98. A gentleman hath $2264l$ per annum, and his expences one day with another are $3l\ 2s\ 6\frac{1}{4}d$ I desire to know how much he layeth up at the year's end? Ans. £. 1122 19 10 $\frac{1}{4}$

99. What is the weight of 37 hogheads of tobacco, each weighing $8cwt\ 1qr\ 21lb$? Ans. Cwt. 312 0 21

100. What is the weight of 109 hogheads of sugar, each weighing $9cwt\ 1qr\ 12lb$? Ans. Cwt. 1019 3 20

COMPOUND DIVISION.

RULE—1. Place the numbers as in simple division, and divide each denomination, beginning at the left hand, by the divisor, setting the quotients under their respective dividends.

2. If there be a remainder after dividing any of the denominations, except the least, find how many of the next lower denomination it is equal to, and add it to the number, if any, which was in this denomination before; then divide the same as usual, and so on till the whole is finished.

3. If the divisor exceeds twelve, divide continually by its component parts, as in simple division.

4. If the divisor cannot be produced by the multiplication of small numbers, divide by it after the manner of long division.

EXAMPLES (Page 41—54)

1. If 3 yards of silk cost 2l 9s what will 1 yard cost?

$$\begin{array}{r} \text{£.} \quad \text{s.} \quad \text{d.} \\ 3 \overline{) 2 \quad 9 \quad 0} \\ \underline{ 6 \quad 0} \\ 3 \quad 0 \end{array}$$

Ans. £.0 16 4

2. If 4 yards of drugget cost 1l 9s what will 1 yard cost? Ans. 7s 3d

3. If five ells of dowlas cost 5s 10d what will 1 ell cost? Ans. 1s 2d

4. If 6 pounds of raisins cost 3s 9d what will one pound cost? Ans. 7½d

5. If 7 pounds of green tea cost 3l 6s 6d what will one pound cost? Ans. 9s 6d

6. If 8 yards of ribbon cost 18s 8d what is that per yard? Ans. 2s 4d

7. If 9 feet of timber cost 15s 9d what will one foot cost? Ans. 1s 9d

8. If ten pounds of tobacco cost 1l 2s 1d what is that a pound? Ans. 2s 2½d

9. If 11 hundred weight of sugar cost 22^l 14^s 8^d what will one hundred weight cost? Ans. £. 2 1 4
10. If 12 quarters of oats cost 14^l 11^s what will one quarter cost? Ans. £. 1 4 3
11. If 14 pounds of tea cost 12^l 5^s what is that per pound? Ans. 17^s 6^d
12. If 15 pounds of bohea tea cost 5^l 18^s 1¹/₂^d what will one pound cost? Ans. 7^s 10¹/₂^d
13. If 16 moidores are worth 21^l 12^s what is the value of one? Ans. £. 1 7 0
14. If 18 pistoles are worth 15^l 15^s what is the value of one? Ans. 17^s 6^d
15. If 20 hundred weight of cheese cost 38^l 13^s 4^d what is that per hundred weight? Ans. £. 1 18 8
16. If 21 ells of holland cost 5^l 18^s 1¹/₂^d what will one ell cost? Ans. 5^s 7¹/₂^d
17. If 22 hundred weight of tobacco cost 122^l 9^s 4^d what will one hundred weight cost? Ans. £. 5 11 4
18. If 24 hundred weight of hops cost 104^l 12^s what will one hundred weight cost? Ans. £. 4 7 2
19. If 25 pair of thread stockings cost 5^l 12^s 6^d how much is that per pair? Ans. 4^s 6^d
20. If 27 pair of silk gloves cost 8^l 0^s 10¹/₂^d what cost one pair? Ans. 5^s 11¹/₂^d
21. If 28 dozen of lemons cost 3^l 14^s 8^d what will one dozen cost? Ans. 2^s 8^d
22. If 30 hundred weight of hemp cost 48^l what is that per hundred weight? Ans. £. 1 12 0
23. If 32 yards of shalloon cost 2^l 16^s what will one yard cost? Ans. 1^s 9^d
24. If 33 tons of hay cost 36^l 6^s what will one ton cost? Ans. £. 1 2 0
25. If 35 yards of broad cloth cost 39^l 7^s 6^d how much is that per yard? Ans. £. 1 2 6
26. If 36 gallons of linseed oil cost 11^l 3^s 6^d what will one gallon cost? Ans. 6^s 2¹/₂^d
27. If 40 firkins of butter cost 65^l what will one firkin cost? Ans. £. 1 12 6
28. If 42 Gloucester cheeses cost 13^l 7^s 9^d what will one cheese cost? Ans. 6^s 4¹/₄^d
29. If 44 gallons of wine cost 43^l 12^s 8^d what is that per gallon? Ans. 19^s 10^d

30. If 45 yards of superfine broad cloth cost $43^l\ 10s$ how much is that a yard? *Ans.* $19s\ 4d$
31. If 48 yards of German serge cost $8^l\ 12s$ what will one yard cost? *Ans.* $3s\ 7d$
32. If 50 yards of Irish cloth cost $6^l\ 2s\ 11d$ what will one yard cost? *Ans.* $2s\ 5\frac{1}{2}d$
33. If 54 chaldron of coals cost $98^l\ 11s$ what will one chaldron cost? *Ans.* $\pounds.1\ 16\ 6$
34. If 55 chaldron of coals cost $82^l\ 10s$ what will one chaldron cost? *Ans.* $1\ 10\ 0$
35. If 56 quarters of barley cost 63^l how much is that per quarter? *Ans.* $\pounds.1\ 2\ 6$
36. If 60 bushels of wheat cost $20^l\ 5s$ what will one bushel cost? *Ans.* $6s\ 9d$
37. If 63 bushel of oats cost $13^l\ 7s\ 9d$ what will one bushel cost? *Ans.* $4s\ 3d$
38. If 64 bushels of beans cost $14^l\ 18s\ 8d$ what will one bushel cost? *Ans.* $4s\ 8d$
39. If 66 pounds of hops cost $5^l\ 1s\ 9d$ what is that per pound? *Ans.* $1s\ 6\frac{1}{2}d$
40. If 70 hundred weight of hay cost $4^l\ 13s\ 4d$ what will one hundred weight cost? *Ans.* $1s\ 4d$
41. If 72 gallons of ale cost 6^l what is that per gallon? *Ans.* $1s\ 8d$
42. If 77 gross of buttons cost $12^l\ 5s\ 5\frac{1}{4}d$ how much is that per gross? *Ans.* $3s\ 9\frac{1}{4}d$
43. If 80 barrels of oysters cost 14^l what cost one barrel? *Ans.* $3s\ 6d$
44. If 81 yards of painting cost $2^l\ 10s\ 7\frac{1}{2}d$ what is that per yard? *Ans.* $7\frac{1}{2}d$
45. If 84 hogsheads of tobacco cost $178^l\ 18s$ what will one hoghead cost? *Ans.* $\pounds.21\ 4\ 6$
46. If 88 hundred weight of fustic cost $19^l\ 16s$ what is the value of one hundred weight? *Ans.* $4s\ 6d$
47. If 90 reams of paper cost 27^l what will one ream cost? *Ans.* $6s$
48. If 96 pieces of lawn cost 240^l what is the value of one piece? *Ans.* $\pounds.2\ 10\ 0$
49. If 99 pieces of Yorkshire cloth cost $84^l\ 10s$ what will one piece cost? *Ans.* $\pounds.8\ 10\ 0$
50. If 100 stone of wool cost 85^l what is the price of one stone? *Ans.* $17s$

51. If 108 dozen of Banbury locks cost $29\text{ l } 14\text{ s}$ what will one dozen cost? Ans. $5\text{ s } 6\text{ d}$

52. If 110 dozen of knives and forks cost $10\text{ l } 15\text{ s } 8\text{ d}$ what will one dozen cost? Ans. $1\text{ s } 10\text{ d}$

53. If 120 slide rules cost 16 l what will one cost? Ans. $2\text{ s } 8\text{ d}$

54. If 121 Gunter's scales cost $7\text{ l } 15\text{ s } 2\text{ d}$ what is the value of one? Ans. $15\text{ s } 2\text{ d}$

55. If 132 dozen of black lead pencils cost $15\text{ l } 8\text{ s}$ what cost one dozen? Ans. $2\text{ s } 4\text{ d}$

56. If 144 brass locks cost $15\text{ l } 12\text{ s}$ how much is that per lock? Ans. $2\text{ s } 2\text{ d}$

57. If 112 pound, or 1 hundred weight of cheese cost $17\text{ l } 10\text{ s } 8\text{ d}$ how much is that a pound? Ans. $4\frac{1}{4}\text{ d}$

58. If 224 pound, or 2 hundred weight of iron cost $3\text{ l } 5\text{ s } 4\text{ d}$ what cost one pound? Ans. $3\frac{1}{2}\text{ d}$

59. If 336 pound, or 3 hundred weight of sugar cost $7\text{ l } 14\text{ s}$ what cost one pound? Ans. $5\frac{1}{2}\text{ d}$

60. If 360 ounces of silver cost 96 l what will one ounce cost? Ans. $5\text{ s } 4\text{ d}$

61. If 560 pounds of salt petre cost $37\text{ l } 6\text{ s } 8\text{ d}$ what cost one pound? Ans. $1\text{ s } 4\text{ d}$

62. If 1728 acres of land cost $1915\text{ l } 4\text{ s}$ what is the value of one acre? Ans. $\text{£. } 1\text{ } 2\text{ } 2$

63. If 17 crewet frames cost $4\text{ l } 13\text{ s } 6\text{ d}$ what will one cost? Ans. $5\text{ s } 6\text{ d}$

64. If 23 dozen of bone knives and forks cost $4\text{ l } 0\text{ s } 6\text{ d}$ what cost one dozen? Ans. $3\text{ s } 6\text{ d}$

65. If 29 dozen of pen knives cost $21\text{ l } 0\text{ s } 6\text{ d}$ what will one dozen cost? Ans. $14\text{ s } 6\text{ d}$

66. If 34 pair of brass candlesticks cost $5\text{ l } 19\text{ s}$ what will one pair cost? Ans. $3\text{ s } 6\text{ d}$

67. If 37 pair of iron candlesticks cost $1\text{ l } 7\text{ s } 9\text{ d}$ what cost one pair? Ans. 9 d

68. If 43 pair of buckles cost $4\text{ l } 13\text{ s } 2\text{ d}$ what will one pair cost? Ans. $2\text{ s } 2\text{ d}$

69. If 39 pounds of tea cost $24\text{ l } 9\text{ s } 1\frac{1}{2}\text{ d}$ what cost one pound? Ans. $12\text{ s } 6\frac{1}{2}\text{ d}$

70. If 47 yards of diaper cost $3\text{ l } 19\text{ s } 5\frac{1}{2}\text{ d}$ what cost one yard? Ans. $1\text{ s } 6\frac{1}{2}\text{ d}$

71. If 53 pair of steel snuffers cost $1\text{ l } 19\text{ s } 9\text{ d}$ what will one pair cost? Ans. 9 d

72. If 59 scale beams cast $19\text{ l } 3\text{ s } 6\text{ d}$. how much is that per. pair ? Ans. $6\text{ s } 6\text{ d}$.
73. If 71 gold balances cost $5\text{ l } 18\text{ s } 4\text{ d}$ what cost one ? Ans. $1\text{ s } 8\text{ d}$
74. If 83 dozen of gilt buttons cost $19\text{ l } 7\text{ s } 4\text{ d}$ what will 1 dozen cost ? Ans. $4\text{ s } 8\text{ d}$
75. What are coals per ton, if 89 tons cost $29\text{ l } 13\text{ s } 4\text{ d}$? Ans. $6\text{ s } 8\text{ d}$
76. If 97 dozen of soap cost $32\text{ l } 6\text{ s } 8\text{ d}$ what cost one. dozen ? Ans. $6\text{ s } 8\text{ d}$
77. If 106 dozen of spelling books cost $43\text{ l } 5\text{ s } 8\text{ d}$ what will one dozen cost ? Ans. $8\text{ s } 2\text{ d}$
78. What are silk stockings per pair if 109 pair cost $55\text{ l } 8\text{ s } 2\text{ d}$? Ans. $10\text{ s } 2\text{ d}$
79. If 123 dozen pounds of candles cost $34\text{ l } 1\text{ s } 7\frac{1}{2}\text{ d}$ what cost 1 dozen pounds ? Ans. $5\text{ s } 6\frac{1}{2}\text{ d}$
80. What are raisins per hundred weight if 145 hundred weight cost $167\text{ l } 19\text{ s } 2\text{ d}$? Ans. $\text{£. } 1\text{ } 3\text{ } 2$
81. If $25\frac{1}{4}$ pounds of sugar cost $18\text{ s } 11\frac{1}{4}\text{ d}$ what will 1 pound cost ? Ans. 9 d
82. If $30\frac{1}{2}$ pounds of tobacco cost $3\text{ l } 12\text{ s } 5\frac{1}{2}\text{ d}$ what will 1 pound cost ? Ans. $2\text{ s } 4\frac{1}{2}\text{ d}$
83. If $35\frac{1}{4}$ barrels of ale cost $54\text{ l } 10\text{ s } 4\frac{1}{2}\text{ d}$ what is that per barrel ? Ans. $\text{£. } 1\text{ } 10\text{ } 6$
84. If $40\frac{1}{2}$ acres of land cost $1301\text{ l } 1\text{ s } 3\text{ d}$ how much is that per acre ? Ans. $\text{£. } 32\text{ } 2\text{ } 6$
85. If $64\frac{1}{4}$ tons of hay cost $167\text{ l } 1\text{ s}$ what cost one ton ? Ans. $\text{£. } 2\text{ } 12\text{ } 0$
86. If $81\frac{1}{2}$ yards of broad cloth cost $97\text{ l } 16\text{ s}$ what will 1 yards cost ? Ans. $\text{£. } 1\text{ } 4\text{ } 0$
87. If $108\frac{1}{4}$ pounds of feathers cost $12\text{ l } 12\text{ s } 7\text{ d}$ what cost 1 pound ? Ans. $2\text{ s } 4\text{ d}$
88. If $120\frac{1}{2}$ ells of holland cost $40\text{ l } 8\text{ s } 4\frac{1}{2}\text{ d}$ what cost 1 ell ? Ans. $6\text{ s } 8\frac{1}{2}\text{ d}$
89. If $132\frac{1}{4}$ feet of deal cost $8\text{ l } 16\text{ s } 4\text{ d}$ what cost 1 foot ? Ans. $1\text{ s } 4\text{ d}$
90. If $144\frac{1}{2}$ gallons of brandy cost $66\text{ l } 4\text{ s } 7\text{ d}$ how much will 1 gallon cost ? Ans. $9\text{ s } 2\text{ d}$
91. If $117\frac{3}{4}$ yards of cloth cost $149\text{ l } 9\text{ s } 10\frac{1}{2}\text{ d}$ what cost 1 yard ? Ans. $\text{£. } 1\text{ } 5\text{ } 6$
92. If $145\frac{1}{2}$ gallons of brandy cost $93\text{ l } 1\text{ s } 2\frac{1}{2}\text{ d}$ what is that per gallon ? Ans. $12\text{ s } 9\frac{1}{2}\text{ d}$

✓ 93. What is land per acre, if $1441\frac{1}{2}$ acres cost $8666/3s$ $6\frac{1}{2}d$? Ans. £. 60 2 4 $\frac{1}{2}$

✓ 94. If $1729\frac{3}{4}$ feet of marble cost $2183/16s$ $2\frac{1}{4}d$ what is the price of 1 foot? Ans. £. 1 5 3

✓ 95. If an officer's salary be $453/11s$ $9\frac{1}{2}d$ a year, how much is that per day? Ans. £. 1 4 10 $\frac{1}{2}$

✓ 96. Suppose a person by trading can clear $4894/2s$ $3\frac{1}{2}d$ in $13\frac{1}{2}$ years, what is his yearly increase of fortune? Ans. £. 362 10 6 $\frac{1}{2}$

97. If the cloathing of an army, consisting of 9652 men, cost government $40669/2s$ $1d$ how much is that per man? Ans. £. 4 4 3 $\frac{1}{2}$

98. Suppose a gentleman has an estate of $2254/$ per annum, how much is his daily expences if he layeth up $1122/19s$ $10\frac{1}{4}d$ at the year's end? Ans. £. 3 2 6 $\frac{1}{4}$

99. If 37 hogshheads of tobacco weigh 312 hundred weight 21 pounds, what is the weight of 1 hogshhead? Ans. C. 8 1 21

100. If 109 hogshheads of sugar weigh 1019 hundred weight, 3 quarters, 20 pounds, what is the weight of one hogshhead? Ans. C. 9 1 12

DUODECIMALS.

This rule is so called because the integer is divided into twelve equal parts.

RULE:—1. Under the multiplicand, write the correspondent denominations of the multiplier.

2. Multiply each term in the multiplicand, beginning with the lowest, by the feet in the multiplier, placing each result under its respective term, observing to carry an unit for every twelve from each lower denomination to its next superior.

3. Work in the same manner with the inches and parts, setting the result of each term one place more to the right hand, and the sum of all will be the product required.

EXAMPLES. (Page 54—58.)

Ex. 1. Multiply 6 feet 6 inches, by 3 feet 2 inches.

$$\begin{array}{r}
 \begin{array}{cc}
 F. & I. \\
 6 & 6 \\
 3 & 2 \\
 \hline
 19 & 6 \\
 1 & 1 & 0 \\
 \hline
 F.20 & 7 & 0 & \text{Ans.}
 \end{array}
 \end{array}$$

2. Multiply 8 feet 4 inches by 5 feet 3 inches.

Ans. F.43 9

3. Multiply 12 feet 6 inches by 8 feet 5 inches.

Ans. F.105 2 6

4. Multiply 26 feet 4 inches by 12 feet 7 inches.

Ans. F.331 4 4

5. Multiply 76 feet 6 inches by 48 feet 3 inches.

Ans. F.3691 1 6

6. Multiply 45 feet 6 inches by 38 feet 7 inches.

Ans. F.1755 6 6

7. Multiply 84 feet 2 inches by 79 feet 2 inches.

Ans. F.6663 2 4

8. Multiply 126 feet 6 inches by 121 feet 3 inches.

Ans. F.15338 1 6

9. Multiply 764 feet 5 inches by 192 feet 4 inches.

Ans. F.147022 9 8

10. Multiply 7681 feet 8 inches by 1926 feet 10 inches.

Ans. F.14801291 4 8

11. Multiply 7 feet 3 inches 3 parts by 1 foot 7 inches 6 parts.

Ans. F.11 9 9 4 6

12. Multiply 8 feet 6 inches 6 parts by 7 feet 3 inches 4 parts.

Ans. F.62 1 11 8

13. Multiply 4 feet 10 inches 6 parts by 3 feet 4 inches 8 parts.

Ans. F.11 7 9

14. Multiply 7 feet 8 inches 6 parts by 7 feet 2 inches 8 parts.

Ans. F.55 8 0 8

15. Multiply 3 feet 6 inches 3 parts by 2 feet 4 inches 6 parts.

Ans. F.8 4 4 1 6

16.

16. Multiply 12 feet 2 inches 10 parts by 9 feet 6 inches 4 parts. *Ans. F.* 116 6 11 11 4
17. Multiply 84 feet 7 inches 6 parts by 76 feet 3 inches 3 parts. *Ans. F.* 6454 5 0 4 6
18. Multiply 87 feet 3 inches 5 parts by 18 feet 1 inch 6 parts. *Ans. F.* 1580 0 5 1 6
19. Multiply 371 feet 2 inches 3 parts by 181 feet 1 inch 3 parts. *Ans. F.* 67223 7 2 9 9
20. Multiply 487 feet 10 inches 10 parts by 186 feet 5 inches 6 parts. *Ans. F.* 90973 6 5 7
21. What is the superficial content of a board whose length is 18 feet 6 inches, and breadth 1 foot 2 inches? *Ans. F.* 21 7
22. How many feet are contained in a floor 45 feet 6 inches long, and 9 feet 4 inches broad? *Ans. F.* 424 8
23. How many square yards of paving are there in a court yard the length of which is 64 feet 6 inches, and breadth 47 feet 8 inches? *Ans. Yards* 341 5 6
24. How many square yards of paving are there in a street, the length 864 feet 3 inches, and breadth 62 feet 6 inches? *Ans. Yards* 6001 6 7 6
25. If a ceiling be 60 feet 9 inches long, and 22 feet 3 inches broad, how many yards doth it contain? *Ans. Yards* 150 1 8 3
26. If a room be painted whose height is 9 feet 3 inches, and its compass 40 feet 6 inches, how many yards doth it contain? *Ans. Yards* 41 5 7 6
27. If a pain of glass be 3 feet 8 inches and three quarters long, and 1 foot 4 inches and two quarters broad, how many feet doe it contain? *Ans. F.* 5 1 6 4 6
28. Suppose there was a window with 15 pains of glass, each 3 feet 7 inches and 3 quarters long, and 1 foot 5 inches and 1 part broad, how many feet of glass are contained therein? *Ans. F.* 77 10 2 11 3
29. How many solid feet are there in a beam whose breadth is 1 foot 6 inches, depth 1 foot 3 inches, and length 16 feet 3 inches? *Ans. F.* 30 5 7 6
30. If a beam be 1 foot 5 inches 6 parts by 1 foot 2 inches and 10 parts, and 12 feet 3 inches 7 parts long, how many solid feet doth it contain? *Ans. F.* 22 2 0 6 2 1

REDUCTION,

Is the altering, or changing numbers from one denomination to another, still retaining the same value.

RULE:—First consider how many of the less name concerned make one of the greater, and by that number multiply the given number, if the reduction be descending, adding to the product the part of the second name, and so on through all the denominations to the last; but divide, if ascending, and the product or quotient, together with the several remainders, if division be used, will be the answer.

EXAMPLES. (Page 58—82)

Ex. 1. In 20 shillings how many pence and farthings?

$$\begin{array}{r}
 \text{S.} \\
 20 \\
 12 \\
 \hline
 240 \text{ Pence} \\
 4 \\
 \hline
 \text{Ans. 960 Farthings.} \\
 \hline
 \end{array}$$

2. How many shillings are there in 960 farthings?

Ans. 20

3. In 36l. how many farthings?

Ans. 34560

4. How many pounds are there in 34560 farthings?

Ans. 36l.

5. In 346l 6s 8d how many farthings?

Ans. 332481

6. How many pounds in 332481 farthings?

Ans. £. 346 6s 8d

7. In 86 guineas how many farthings?

Ans. 86688

8. Now many guineas are there in 86688 farthings?

Ans. 86g.

9. In 384l how many four-pences?

Ans. 23040

10. How many pounds in 23040 groats?

Ans. 384l

11. In 682 moidores how many farthings?

Ans. 883872

12. How many moidores in 83872 farthings? Ans. 682
13. In 1000l how many crowns, half-crowns, and pence?
Ans. 4000 crowns, 8000 half-crowns, 240000 pence
14. Reduce 240000 pence to crowns, half-crowns, and pounds.
Ans. 8000 half-crowns, 4000 crowns, 1000l.
15. In 234l how many crowns, shillings, groats, and pence?
Ans. 936 c. 4680 shil. 14040 gr. 56160 pence
16. Reduce 56160 pence to groats, shillings, crowns, and pounds.
Ans. 14040 gr. 4680 shil. 936 c. 234l.
17. In 152l how many shillings and crowns?
Ans. 3040 shillings, 608 crowns
18. In 608 crowns how many shillings and pounds?
Ans. 3040s 152l
19. In 695l 8s how many ducats, at 4s 9d each?
Ans. 2928
20. In 2928 ducats, each in value 4s 9d how many pounds?
Ans. £.695 8
21. In 4321l 13s 9d how many pieces at 13½d each?
Ans. 76830 pieces
22. In 76830 pieces of 13½d each how many pounds?
Ans. £.4321 13 9
23. In 16 ingots of gold, each in value 36 guineas, how many quarter guineas may be made thereof?
Ans. 2304
24. In 2304 quarter guineas how many ingots will they make, the value of each ingot 36 guineas?
Ans. 16
25. In 993l 4s 6d how many dollars, at 4s 3d each?
Ans. 4674 dollars
26. In 4674 dollars, at 4s 3d each, how many pounds?
Ans. £.993 4 6
27. In 360 talents of silver, each 357l 11s 10½d how many farthings?
Ans. 123584400
28. In 123584400 farthings how many talents of silver, each in value 357l 11s 10½d?
Ans. 360
29. In 426l 14s how many crowns, half-crowns, and shillings, and of each an equal number?
Ans. 1004
30. In 1004 crowns, as many half-crowns, and the same number of shillings, how many pounds?
Ans. £.426 14
31. A merchant agrees with a cashier to change 58l 2s 6d for pieces of 13½d, 12d, 9d, 6d, 4d, and of 2d, and

to have of each sort an equal number of pieces, I desire to know the number ?

Ans. 300

32. A merchant has received from a cashier three hundred pieces of each of the following sorts, viz. $13\frac{1}{2}d$, $12d$, $9d$, $6d$, $4d$, and $2d$, how many pounds must the cashier receive for the same ?

Ans. £. 58 2 6

33. In 1120 dollars at $4s\ 3d$ each how many pounds ?

Ans. £. 238

34. In 238l how many dollars at $4s\ 3d$ each ?

Ans. 1120

35. In 560 pistoles at $17s$ each, how many pounds ?

Ans. 476

36. In 476l how many pistoles, at $17s$ each ?

Ans. 560

37. In 800 quarter guineas how many pounds ?

Ans. 210

38. In 210l how many quarter guineas ?

Ans. 800

39. In 896 nobles at $6s\ 8d$ each how many pounds ?

Ans. £. 298 13 4

40. In 298l $13s\ 4d$ how many nobles at $6s\ 8d$ each ?

Ans. 896

41. How many moidores are equal in value to 225 guineas ?

Ans. 175

42. In 175 moidores how many guineas ?

Ans. 225

43. How many crowns are equal to 170 pistoles at $17s$ each ?

Ans. 578

44. How many pistoles at $17s$ each are equal to 578 crowns ?

Ans. 170

45. How many ducatoons, at $5s\ 6\frac{1}{2}d$ each, are worth 14630 cobs at $4s\ 7d$ each ?

Ans. 12100

46. How many cobs at $4s\ 7d$ each are worth 12100 ducatoons at $5s\ 6\frac{1}{2}d$ each ?

Ans. 14630

47. How many milreas at $6s\ 8\frac{1}{2}d$ each are worth 644 Romish crowns at $7s\ 6d$ each ?

Ans. 720

48. How many Romish crowns at $7s\ 6d$ each are worth 720 milreas at $6s\ 8\frac{1}{2}d$ each ?

Ans. 644

49. In 23 pounds of silver how many grains ?

Ans. 132480

50. How many pounds of silver are there in 132480 grains ?

Ans. 23lb.

51. In 18 pounds, 6 ounces, 8 pennyweights, and 4 grains of silver, how many grains ?

Ans. 106756

52. In 106756 grains of silver how many pounds?
Ans. 18lb 6oz 8dwt 4grs
53. In 8 ingots of silver, each weighing 3lb 4oz 2dwt 9grs how many grains?
Ans. 154056
54. How many ingots of silver, 3lb 4oz 2dwt 9grs each, are there in 154056 grains?
Ans. 8 ingots
55. How many silver tankards, each weighing 55 ounces 9 pennyweights 14 grains, can a silversmith make out of 41 pounds 7 ounces 6 pennyweights 6 grains of silver?
Ans. 9
56. In 9 silver tankards, each weighing 55 ounces 9 pennyweights 14 grains, how many pounds?
Ans. 41lb 7oz 6dwt 6grs
57. In 24 pounds of apothecaries' drugs how many grains?
Ans. 138240
58. In 138240 grains how many pounds?
Ans. 24
59. In 421 pounds 6 ounces 3 drams 2 scruples and 9 grains, how many grains?
Ans. 2428069
60. In 2428069 grains how many pounds?
Ans. 421lb 6oz 3dr 2scr 9gr
61. Suppose the gentlemen of the faculty belonging to the General Hospital, at Birmingham, make up a medical composition of 12 pounds 6 ounces, how many boluses may be made thereof, each weighing 4 scruples, and supposing these boluses were to be equally divided amongst 45 patients, how many must each one have?
Ans. 20 each
62. Suppose 45 patients were to have 20 boluses each, and each bolus to weigh 4 scruples, how many pounds of ingredients will it take to make the whole composition?
Ans. 12lb 6oz
63. In 16 tons of iron how many drams?
Ans. 9175040
64. In 9175040 drams how many tons?
Ans. 16
65. In 146 tons 12 hundred weight 2 quarters 8 pounds 4 ounces 6 drams, how many drams?
Ans. 84082758
66. In 84082758 drams how many tons?
Ans. 146 tons 12 cwt 2qr 8lb 4oz 6drs
67. In 7 hogheads of tobacco, each weighing 7 hundred weight 2 quarters 21 pounds how many pounds?
Ans. 6027 pounds
68. How many hogheads, weight 7 hundred 2 quarters 21 pounds each, are there in 6027 pounds?
Ans. 7h 6q.

69. How many parcels, each weighing 12 pounds 13 ounces, can I make out of 41 hundred weight 1 quarter 18 pounds 2 ounces?

Ans. 362 parcels

70. In 362 parcels, each weighing 12 pounds 13 ounces, how many hundred weight?

Ans. 41 cwt 1 qr 18 lb 2 oz

71. How many parcels of 4 pounds, 6 pounds, 10 pounds, and 12 pounds, can a grocer have out of 4 hogheads of raisins, each weighing neat 4 hundred weight 2 quarters 8 pounds, and to have of each an equal number?

Ans. 64 parcels

72. A grocer hath 4 hogheads of raisins made up into 64 parcels of the following weights, viz. 4 pounds, 6 pounds, 10 pounds, and 12 pounds, and desires to know how many hundred weight there are in one hoghead?

Ans. 4 cwt 2 qr 8 lb

73. In 342 yards of cloth how many nails?

Ans. 5472

74. How many yards are there in 5472 nails?

Ans. 342 yards

75. In 62 yards 2 quarters 1 nail how many nails?

Ans. 1001

76. How many yards in 1001 nails?

Ans. 62 yds. 2 qr 1 nail

77. Reduce 40 English ells 3 quarters 2 nails, into nails.

Ans. 814

78. In 814 nails how many English ells?

Ans. 40 E. E. 3 qr. 2 na.

79. In 84 Flemish ells 2 quarters and 3 nails, how many nails?

Ans. 1019

80. Reduce 1019 nails to Flemish ells.

Ans. 84 F El 2 qr 3 na

81. In 36 pieces of cloth, each piece containing 52 yards, how many nails?

Ans. 29952

82. How many pieces of cloth, each piece containing 52 yards, are there in 29952 nails?

Ans. 36

83. How many yards of cloth will cloath 90 charity boys, allowing for each boy 3 yards and a quarter?

Ans. 292½

84. If 90 charity boys take 292 yards and 2 quarters of cloth to cloath them, how many yards is that per boy?

Ans. 3 yds 1 qr

85.

85. In 1 league how many miles, furlongs, and poles?
Ans. 3^m 24^{fur} 960^p
86. 960 poles, how many leagues?
Ans. 1
87. In 48 miles how many furlongs, poles, yards, feet, inches, and barley corns?
Ans. 384^f 15360^p 84480^{yds} 253440^{ft} 3041280^{inch} 9123840^{b.c.}
88. In 9123840 barley corns, how many miles?
Ans. 48
89. How many times doth the wheel, which is $16\frac{1}{2}$ feet in circumference, turn round between Birmingham and Worcester, being 25 miles asunder?
Ans. 8000
90. In 8000 turns of a wheel, $16\frac{1}{2}$ feet in circumference, how many miles will it run over?
Ans. 25 miles
91. How many paces, feet, inches, and barley corns, will reach round the globe of our earth, supposing it, according to the best computations, to be 25020 miles?
Ans. 26421120^{pa}, 132105600^{ft}, 1585267200ⁱⁿ, 4755801600^{b.c.}
92. In 4755801600 barley corns how many miles?
Ans. 25020
93. In 484 acres of land how many poles?
Ans. 77440
94. In 77440 poles how many acres?
Ans. 484
95. In 4321 acres 3 roods 34 poles how many poles?
Ans. 691514
96. In 691514 poles how many acres?
Ans. 4321 A 3^r 34^p
97. A certain common, containing 4140 acres, is to be divided into shares of 360 perches each, how many shares doth the whole contain?
Ans. 1840
98. Suppose a common was divided into 1840 equal shares of 360 perches each, how many acres are there in the whole?
Ans. 4140
99. In 46 hogheads of wine how many pints?
Ans. 23184
100. In 23184 pints of wine how many hogheads?
Ans. 46
101. In 46 tons 3 hogheads 45 gallons 3 quarts one pint how many pints?
Ans. 94615
102. In 94615 pints how many tons of wine?
Ans. 46 T 3^{hhd} 45 gal 3^{qr} 1^{pi}

103. Out of 15 hogheads of wine how many dozen of quart and pint bottles can be filled, so as to have of each sort an equal number? Ans. 210

104. How many hogheads of wine will it take to fill 210 dozen quart and as many pint bottles? Ans. 15

105. In 21 hogheads of ale how many pints? Ans. 8064

106. In 8064 pints of ale how many hogheads? Ans. 21

107. In 30 hogheads of beer how many pints? Ans. 12960

108. In 12960 pints of beer how many hogheads? Ans. 30

109. In 363 barrels of beer how many hogheads, gallons, and pints? Ans. 242bbd 13068gal 104544pi

110. In 104544 pints of beer how many barrels? Ans. 363

111. In 6 butts 1 hoghead 40 gallons 2 quarts of beer how many hogheads, barrels, and firkins, and of each an equal number? Ans. 7 of each, and 198qts remain

112. Out of a quantity of beer a brewer filled 7 hogheads, 7 barrels, and 7 firkins, and 198 quarts remaining, how many butts did he brew? Ans. 6bts 1bbd 40gal 2qts

113. In 304 quarters of corn how many gallons? Ans. 19456

114. In 19456 gallons of corn how many quarters? Ans. 304

115. In 4 lasts of corn how many pints? Ans. 20480

116. In 20480 pints of corn how many lasts? Ans. 4 lasts

117. In 2 lasts 1 wey 3 quarters 2 bushels 3 pecks and 1 gallon, how many gallons? Ans. 1815

118. In 1815 gallons of corn how many lasts? Ans. 2lasts, 1wey, 3qts, 2bu, 3pks, 1gal

119. In 124 chaldrons of coals how many pecks? Ans. 17856

120. In 17856 pecks of coals how many chaldrons? Ans. 124

121. In 421 chaldrons 12 bushels of coals how many sacks, 3 bushels each? Ans. 5056

122. In 5056 sacks of coals, each 3 bushels, how many chaldrons? Ans. 421chal. 12bush.

123. How many seconds are there in a solar year?
Anf. 31556935
124. In 31556935 seconds how many days?
Anf. 365days, 5b, 48m, 55"
125. Suppose the creation of the world was 4007 years before the birth of Christ, how many seconds is it since to Christmas 1785, allowing solar years? - Anf. 182777767520
126. In 182777767520 seconds how many years?
Anf. 5792
127. In 12 revolutions how many seconds?
Anf. 15552000
128. In 15552000 seconds of a degree how many revolutions?
Anf. 12
129. In 41 revolutions, 6 signs, 4 degrees, 30 minutes, and 45 seconds, how many seconds? Anf. 53800245
130. In 53800245 seconds how many revolutions?
Anf. 41revo, 6si, 4deg, 30' 45"
131. In 1 square yard how many square inches?
Anf. 1296
132. In 1296 square inches how many square yards?
Anf. 1
133. How many square yards are there in a street, the length of which is 864 feet 3 inches, and breadth 62 feet 6 inches?
Anf. 6001yds, 6f, 7in, 6p
134. In 1 square mile how many acres, roods, poles, yards, feet, and inches?
Anf. 640A. 256or. 102400p.
3097600yas. 27878400ft. 4014489600in.
135. In 4014489600 square inches how many square miles?
Anf. 1
136. In 1 solid yard how many feet and inches?
Anf. 27ft. 46656in.
137. In 46656 solid inches how many solid yards?
Anf. 1
138. How many solid feet are there in a beam, whose breadth is 18 inches, depth 15 inches, and length 16 feet 3 inches?
Anf. 30ft. 5in. 7pa. 6f.

THE RULE OF THREE DIRECT,

Teacheth from three numbers given, to find a fourth in proportion for the answer.

RULE.—State the question; that is, place the numbers so, that the first and third may be of the same name, and the second the same as the fourth number required.

2. Bring the first and third numbers into the same denomination, and the second into the lowest name mentioned.

3. Multiply the second and third numbers together, and divide the product by the first, and the quotient will be the answer to the question, in the same denomination you left the second number in, which may be brought into any other denomination required.

EXAMPLES (Page 83—122)

Ex. 1. If 3 yards of cloth cost 18 shillings, what will 9 yards cost?

$$\begin{array}{rcl}
 \text{Yds.} & \text{s.} & \text{Yds.} \\
 3 & : 18 & :: 9 \\
 & 9 & \\
 & \hline
 & 3)162 & \\
 & \hline
 & 2|0)514 & \\
 & \hline
 \text{£. } 2 & 14 & \text{Ans.}
 \end{array}$$

2. If I gave 2*l* 14*s* for 9 yards of cloth, how many yards can I buy for 18*s* Ans. 3 yds.

3. If 4 yards cost 2*l* what will 14 yards cost? Ans. £. 7 0 0

4. If 14 yards cost 7*l* how many yards of the same can I have for 2*l*? Ans. 4 yds.

5. If 9 yards of cloth cost 3*l* what will 36 yards cost?
Anf. £. 12
6. Suppose I gave 12*l* for 36 yards of cloth, how many yards of the same can I buy for 3*l*?
Anf. 9 yards
7. If 3 yards of silk cost 2*l* 9*s* what will 24 yards cost?
Anf. £. 19 12
8. If 19*l* 12*s* pay for 24 yards of cloth, how many yards will 2*l* 9*s* pay for?
Anf. 3 yds.
9. If 4 yards of drugget, cost 1*l* 9*s* what will 48 yards cost?
Anf. £. 17 8 0
10. Suppose I gave 17*l* 8*s* for 48 yards of drugget, how many yards can I buy for 1*l* 9*s* 0*d*?
Anf. 4
11. If 7 yards of cloth cost 3*l* 6*s* 6*d* what will 36 cost?
Anf. £. 17 2
12. If I give 17*l* 2*s* for 36 yards of cloth, how many yards can I buy for 3*l* 6*s* 6*d*?
Anf. 7
13. If 8 yards of ribbon cost 18*s* 8*d* what will 54 yards cost?
Anf. £. 6 6 0
14. If 54 yards cost 6*l* 6*s* how many yards may be bought for 18*s* 8*d*?
Anf. 8
15. If 9 feet of timber cost 15*s* 9*d* what will 72 feet cost?
Anf. £. 6 6 0
16. Suppose I gave 6*l* 6*s* for 72 feet of timber, how many feet can I have for 15*s* 9*d*?
Anf. 9
17. If 10 pound of tobacco cost 1*l* 9*s* 1*d* what will 81 pounds cost?
Anf. £. 8 18 10½
18. If 81 pounds of tobacco cost 8*l* 18*s* 10½*d* how many pounds may be bought for 1*l* 2*s* 1*d*?
Anf. 10
19. If 12 quarters of oats cost 14*l* 11*s* what will 90 quarters cost?
Anf. £. 109 2 6
20. Suppose I gave 109*l* 2*s* 6*d* for 90 quarters of oats, how many quarters can I have for 14*l* 11*s*?
Anf. 12
21. If 14 pounds of tea cost 12*l* 5*s* what will 99 pounds cost?
Anf. £. 86 12 6
22. If 99 pounds of tea cost 86*l* 12*s* 6*d* how many pounds may be bought for 12*l* 5*s*?
Anf. 14
23. If 15 pounds of raisins cost 5*l* 18*s* 1½*d* what will 108 pounds cost?
Anf. 42*l* 10 6
24. Suppose I gave 42*l* 10*s* 6*d* for 108 pounds of raisins, how many pounds of the same can I buy for 5*l* 18*s* 1½*d*?
Anf. 15lb.

The Rule of Three Direct.

5.

25. If 18 yards of silk damask cost 17*l* 19*s* 7½*d* what will 48 yards cost? *Ans.* £. 47 19 0
26. If 47*l* 19*s* pay for 48 yards of silk, how many yards will 17*l* 19*s* 7½*d* pay for? *Ans.* 18
27. If 21 ells of holland cost 5*l* 18*s* 1½*d* what will 72 ells cost? *Ans.* £. 20 5
28. Suppose I gave 20*l* 5*s* for 72 ells of holland, how many ells can I have for 5*l* 18*s* 1½*d*? *Ans.* 21
29. If 27 pair of silk gloves cost 8*l* 0*s* 10½*d* what will 81 pair cost? *Ans.* £. 24 2 7½
30. If 81 pair of gloves cost 24*l* 2*s* 7½*d* how many pair can I buy for 8*l* 0*s* 10½*d*? *Ans.* 27
31. If 45 dozen of claret wine cost 73*l* 2*s* 6*d* what will 120 dozen cost? *Ans.* £. 195
32. If 120 dozen of claret wine cost 195*l* how many dozen can I buy for 73*l* 2*s* 6*d*? *Ans.* 45
33. If 56 quarters of barley cost 63*l* what will 144 quarters cost? *Ans.* £. 162
34. If 144 quarters of barley cost 162*l* how many quarters can I buy for 63*l*? *Ans.* 56
35. If 72 gallons of Burton ale cost 6*l* what will 25 hogheads, London measure, come to? *Ans.* £. 112 10
36. If 25 hogheads of ale cost 112*l* 10*s* how many gallons of the same can I buy for 6*l*? *Ans.* 72
37. If 77 gross of buttons cost 12*l* 5*s* 5¼*d* what will 144 gross cost? *Ans.* £. 22 19
38. If 144 gross of buttons cost 22*l* 19*s* how many gross can I buy for 12*l* 5*s* 5¼*d*? *Ans.* 77
39. If 81 pounds of tobacco cost 6*l* how much can I buy for 15*l* 10*s*? *Ans.* 209¼*lb.*
40. If 209¼ pounds of tobacco cost 15*l* 10*s* what will 81 pounds cost? *Ans.* £. 6
41. If 70 yards of cloth cost 78*l* 15*s* how many yards may be bought for 38*l* 5*s*? *Ans.* 34
42. If 34 yards of cloth cost 38*l* 5*s* what will 70 yards cost? *Ans.* £. 78 15
43. If 7½ yards cost 17*s* 6*d* what will 515 yards cost? *Ans.* £. 60 1 8
44. If 515 yards cost 60*l* 1*s* 8*d* how many yards may be bought for 17*s* 6*d*? *Ans.* 7½ yds.

45. If 3 ounces 10 pennyweights of silver plate cost 17/15 10½^d what will 655 ounces 4 pennyweights 16 grains cost?

Ans. £. 204 15 2½

46. If 655 ounces 4 pennyweights 16 grains of silver cost 204/15s 2½^d how many ounces may be bought for 17/15 10½^d?

Ans. 302. 10dwt.

47. If 2 hogheads 19½ gallons of brandy cost 93/15 2½^d what will 12 pipes 1 hoghead 36 gallons cost?

Ans. £. 1030 7 4½

48. If 12 pipes 1 hoghead, 36 gallons of brandy cost 1030/7s 4½^d how many hogheads may be bought for 93/15 2½^d?

Ans. 2 hhd. 19½ gal.

49. If 16½ pounds of raisins cost 8s 11¼^d what will 10 casks cost, each 5 hundred 2 quarters 18 pounds?

Ans. £. 171 14 2

50. If 10 casks of raisins, each weighing 5 hundred weight, 2 quarters, 18 pounds, cost 171/14s 2^d how many pounds may be bought for 8s 11¼^d?

Ans. 16½

51. If 1 hundred weight, 3 quarters, 13 pounds, 4 ounces of tobacco cost 15/10s; what will 9 hogheads cost, each weighing 8 hundred weight, 1 quarter, 12 pounds?

Ans. £ 624 0 0

52. If 9 hogheads of tobacco, each weighing 8 hundred weight, 1 quarter, 12 pounds, cost 624/ how many pounds can I buy for 15/10s?

Ans. C. 1 3 13 4

53. If 4 hundred 2 quarters, 6 pounds, 8 ounces of sugar cost 24/16s 8¼^d what will 5 hogheads cost, each weighing net 8 hundred, 3 quarters, 6 pounds, 4 ounces?

Ans. 39 17 9¾ 5340

54. If 5 hogheads of sugar, each weighing 8 hundred, 3 quarters, 6 pounds, 4 ounces cost 239/17s 9¾ 5340 how much can I buy for 24/16s 8¼^d?

Ans. 8168 oz.

55. If 252 gallons of wine cost 50/8s 6¾^d what will 12 tons, 3 hogheads, 46 gallons cost?

Ans. £. 652 3 3¼ 45½

56. If 12 tons 3 hogheads, 46 gallons of wine cost 652/3s 3¼ 45½ how many gallons can I have for 50/8s 6¾^d?

Ans. 252

57. Suppose I gave 69/18s 7^d for 1 hundred weight, 1 quarter, 7 pounds, 4 ounces of tea, what weight can I have for 560/10s 4¼^d?

Ans. C. 10 2 4 4 35844

58.

58. If 10 hundred, 2 quarters, 4 pound, 4 ounces $\frac{35844}{67132}$ of tea cost 560l 10s 4 $\frac{1}{2}$ d what will 1 hundred weight, 1 quarter, 7 pounds, 4 ounces, of the same cost?

Ans. £. 69 18 7

59. A draper bought of a merchant 24 packs of cloth, each pack had 24 parcels, each parcel contained 40 pieces, and each piece 120 yards; he gave at the rate of 8l 17s 6 $\frac{1}{2}$ d for every 24 yards; I desire to know what the 24 packs cost him?

Ans. £. 1022760

60. A merchant bought 24 packs of cloth, which cost him 1022760l each pack contained 24 parcels, each parcel 40 pieces, and each piece 120 yards, I desire to know how many yards of the said cloth I can buy for 8l 17s 6 $\frac{1}{2}$ d at prime cost?

Ans. 24 yards

61. If 43 pounds, 6 ounces, 3 drams, of copper cost 2l 5s 1 $\frac{1}{2}$ d how much will 4 tons, 6 hundred weight, 2 quarters, 4 pounds, 6 ounces cost?

Ans. £. 503 16 0 $\frac{1}{2}$ d $\frac{1370}{11107}$

62. If 4 tons, 6 hundred weight, 2 quarters, 4 pounds, 6 ounces of copper cost 503l 16s 0 $\frac{1}{2}$ d $\frac{1370}{11107}$ what quantity can I buy for 2l 5s 1 $\frac{1}{2}$ d?

Ans. 11107 drams

63. A grocer bought 16 hundred weight, 2 quarters, 14 pounds weight of cloves, which cost him 240l 2s and he would gain 42l by the bargain, at what rate must he sell them at per pound?

Ans. 3s 0 $\frac{1}{4}$ d $\frac{826}{1882}$

64. If 1 pound weight of cloves cost 3s 0 $\frac{1}{4}$ d $\frac{826}{1882}$ what quantity of cloves at the same price can I buy for 282l 2s?

Ans. C 16 2 14

65. A merchant bought 72 tons of wine for 482l the charges upon it amounted to 173l and he would gain 260l by the whole; a gentleman came to him and demands the price of 12 tons, what must he give him?

Ans. £. 152 10 0

66. If 12 tons of wine cost 152l 10s how many tons of the same wine can be bought for 915l at the same rate?

Ans. 72

67. Suppose I have by me 400 yards of broad cloth, which cost me 180l but some damage having happened to it, I am willing to lose 15l by the whole; at what rate then must I sell it per yard?

Ans. 8s 3d

68. If 1 yard of broad cloth cost 8s 3d how many yards can I buy for 165l?

Ans. 400

69. If 57 yards of yard-wide stuff exactly line 41 yards of silk of another breadth; how many yards of the latter will

will line 552 pieces of the former, each piece being $85\frac{1}{2}$ yards? Ans. 33948

70. If 33948 yards of yard-wide stuff line 552 pieces of silk of another breadth, each piece containing $85\frac{1}{2}$ yards; how many yards of the latter will line 41 yards of the former? Ans. 57

71. Bought a quantity of holland for which I gave 443l 8s 8d, how many pieces were there, each piece containing 28 Flemish ells. if 1 ell cost me 3s 4d? Ans. 95

72. If 95 pieces of holland cost 443l 6s 8d, each piece containing 28 ells Flemish, I desire to know how I must sell it per ell? Ans. 3s 4d

73. I have by me a piece of cloth which cost 20l 16s 4 $\frac{1}{2}$ d how many yards doth it contain, the ell English being worth 9s 6 $\frac{1}{2}$ d? Ans. yds. 54 1 2 $\frac{3}{4}$

74. If 54 yards, 1 quarter, 2 na. $\frac{390}{459}$ nails of cloth cost 20l 16s 4 $\frac{1}{2}$ d how must I sell it per ell English, so as to be no loser by it? Ans. 9s 6 $\frac{1}{4}$ d

75. St. Martin's spire, in Birmingham, at a certain time projected upon level ground, a shadow to the distance of 144 yards, 2 feet, 2 inches, when my cane, 3 feet 2 inches in length, perpendicularly erected, cast a shadow of 6 feet 3 inches; from hence the height of the spire is required? Ans. yds. 73 0 11 $\frac{5}{8}$

76. The height of a certain steeple is 73 yards, 0 feet, 11 $\frac{5}{8}$ inches, and the length of its shadow at a certain time of the day is 144 yards, 2 feet, 2 inches; I desire to know from hence how long the shadow of my cane will be at the same time, whose length is 3 feet 2 inches? Ans. 6 feet, 3 inches

77. If the report of a cannon fired at a distance be heard $8\frac{1}{2}$ seconds of time after the flash is seen, how far off was the cannon fired? Ans. 9707 feet

78. If the report of a cannon fired at the distance of 9707 feet be heard in $8\frac{1}{2}$ seconds of time after the flash is seen, in what time will the report be heard at the distance of 1142 feet? Ans. 1 sec.

79. Suppose I see a flash of lightning, and count 5 seconds before I hear the thunder, how far is the thunder-cloud from me? Ans. 1 mile 430 feet

80. Suppose a thunder-cloud be 5710 feet from me, and hear the thunder in 5 seconds after I see the lightning, in

in how many seconds of time shall I hear the thunder after I see the lightning, if the cloud be only 1142 feet from me?

Ans. 1 second.

81. If 100*l* in 12 months gain 4*l* 10*s* interest, what will 96*l* 4*s* gain in the same time, at the same rate per cent?

Ans. £. 4 6 6 $\frac{1}{2}$ $\frac{1680}{1000}$

82. If 96*l* 4*s* principal, in 12 months gain 4*l* 6*s* 6 $\frac{1}{2}$ $\frac{1680}{1000}$ *d* how much principal must I put to interest at the same rate and time, to gain 4*l* 10*s*?

Ans. 100*l*

83. Suppose I sold goods to the value of 146*l* 10*s* to be paid in a year's time, what is the discount at 4 $\frac{1}{2}$ per cent?

Ans. £. 6 6 2 $\frac{140}{1000}$

84. If the discount of 146*l* 10*s* for a year at 4 $\frac{1}{2}$ per cent. be 6*l* 6*s* 2 $\frac{140}{1000}$ *d*. I desire to know the value of those goods for which I was allowed 4*l* 10*s* discount, at the same rate and time?

Ans. £. 146 10*s*

85. Suppose a Bankrupt owes 25262*l* 12*s* 4 $\frac{1}{2}$ *d* and has in cash, goods, and recoverable debts, 12631*l* 6*s* 2 $\frac{1}{4}$ *d* if these things are delivered to his creditors what do they get in the pound?

Ans. 10*s*

86. Suppose a person fails in trade, and compound with his creditors to pay them 10*s* in the pound, how much doth he owe when all his cash, goods, and recoverable debts, amount only to 12631*l* 6*s* 2 $\frac{1}{4}$ *d*?

Ans. £. 25262 12 4 $\frac{1}{2}$

87. If a lever be 140 inches long, what weight, lying 12 $\frac{1}{2}$ inches from the end, resting on a pavement, may be moved with a force of 186*lb*. lifting at the other end of the lever?

Ans. 1897 $\frac{5}{3}$ *lb*

88. If a man lifting with the force of 186*lb* at the end of a lever, is able to move a weight of 1897 $\frac{5}{3}$ *lb* fixed at the distance of 127 $\frac{1}{2}$ inches from his hand, the question is, what distance the weight must be from the other end which meets with a convenient prop?

Ans. 12 $\frac{1}{2}$ inches.

89. A person bought 864 eggs at 3 a penny, another sort at 2 a penny, which together were sold out for 2*l* 6*s* 4*d* how many eggs were bought at 2 a penny?

Ans. 536.

90. A person bought 536 eggs at 2 a penny, another sort at 3 a penny, which together were sold out for 2*l* 6*s* 4*d* how many eggs were bought at 3 a penny?

Ans. 864.

91. A may-pole 50 feet 11 inches high, at a certain time of the day, casts a shadow 98 feet 6 inches long, I

* G

would

would thereby find the height of a tower which at the same time throws the extremity of its shadow to the distance of 581 feet 7 inches?

Ans. 300 ft. $7\frac{695}{1182}$ inches.

92. A tower 300 feet $7\frac{695}{1182}$ inches high, at a certain time of the day cast a shadow 581 feet 7 inches long. I desire to know from hence, how long the shadow of a may-pole will be at the same time, whose height is 50 feet 11 in.?

Ans. 98 ft. 6 inches.

93. In the latitude of Birmingham, the distance round the earth measuring in the parallel of latitude, is about 15540 miles, now as the earth turns round in 23 hours 56 minutes, at what rate per hour is the town of Birmingham carried by this motion, from west to east?

Ans. $649\frac{109}{339}$ miles.

94. If the inhabitants of Birmingham, by the earth's motion be carried $649\frac{109}{339}$ miles an hour, in how many hours will they be carried 15540 miles by this rotation?

Ans. 23 hours 56 minutes.

95. If the diameter of the moon be supposed $33' 28''$, and the deficient scruples at a lunar eclipse, are found to be $29' 28''$, what are the digits eclipsed, allowing the whole to be 12 digits?

Ans. 10 dig. $33' 56''\frac{164}{331}$.

96. At a lunar eclipse, it was found by observation, that the digits eclipsed was $10^{\circ} 33' 56''\frac{164}{331}$, and the deficient scruples $29' 28''$ from hence it is required to find the moon's diameter allowing the whole to be 12 digits as before?

Ans. $33' 28''$.

97. A merchant sent goods to Maderia to the value of 2290/ 10s to have returns from thence, the $\frac{1}{3}$ in sugar at 1/ 3s 3d per cwt. and the rest in wine at 43/ 16s a ton; how much of each of these goods must he receive to balance his adventure?

Ans. $656\frac{216}{279}$ cwt. sugar, and $34\frac{756}{878}$ tons, wine.

98. A merchant received from Maderia, goods to the amount of 2290/ 10s for $\frac{1}{3}$ of the money he received $656\frac{216}{279}$ cwt. of sugar, and for the remainder $34\frac{756}{878}$ tons of wine; how much was the sugar per cwt. and what was the wine per ton?

Ans. 1/ 3s 3d cwt. and 43/ 16s per ton.

99. In hunting a hair the gentlemen found that the hare had 120 hounds before the hound, and as often as the hare

hare runneth 16 paces, the hound runneth but 12 paces, but 4 paces of the hound's are as much as 6 of the hare's paces; how many paces must the hound run before he overtakes the hare? *Ans.* 1080 paces.

100. A gentleman hunteth a hare, and as often as the hound runneth 12 paces, the hare runneth 16, and 4 paces of the hound are equal to 6 of the hare, and the hound overtaketh the hare in 1080 of his own paces, how many hounds paces was the hare before him? *Ans.* 120.

THE RULE OF THREE INVERSE,

IS, when having three numbers given, and you are required to find a fourth, in the same proportion to the second, as the first has to the third.

RULE.—Multiply the first and second terms together, and divide their product by the third, the quotient is the answer to the question, in the same denomination you left the second term in.

The method of proof is by inverting the question.

EXAMPLES (Page 123—130).

Ex. 1. If 3 men can do a piece of work in 6 days, in how many days will six men do it?

$$\begin{array}{ccc} M. & D. & M. \\ 3 & : 6 & :: 6 \end{array}$$

3

6)18

3 days *anf.*

$$\begin{array}{ccc} D. & M. & D. \\ 3 & : 6 & :: 6 \end{array}$$

3

6)18

3 men *proof*

2. If 6 men do a piece of work in 3 days, how many men will do it in 6 days? Ans. 3

3. If 18 men be 30 days in finishing a piece of work, in how many days will 24 men do it? Ans. $22\frac{1}{2}$

4. If 24 workmen can finish a piece of work in $22\frac{1}{2}$ days, how many are sufficient to do the same in 30 days? Ans. 18

5. If a board be 5 inches broad, how many inches in length will make a square foot? Ans. $28\frac{1}{4}$

6. If a board 5 inches broad, take $28\frac{1}{4}$ inches long to make a square foot, how many inches broad will make a square foot if the length be 12 inches? Ans. 12

7. How long must my friend lend me 162*l* for the use of 90*l* I lent him for 540 days? Ans. 300 days

8. How many pounds must my friend lend me 540 days, for the use of 162*l* I lent him 300 days? Ans. 90*l*

9. If the penny loaf weighs 11 oz. 8 dwts. when wheat is 9*s* 6*d* per bushel, what must it weigh when wheat is 9*s* 6*d* per bushel? Ans. 6 oz

10. If the penny loaf weighs 6 oz. when wheat is 9*s* 6*d* per bushel, how much is wheat per bushel when the penny loaf weighs 11 oz. 8 dwts? Ans. 5*s*

11. Provisions in garrison are found sufficient to last 7200 soldiers for 8 months; but a reinforcement being wanted that the provisions might last for 6 months only, what is the greatest number of soldiers that can be added to the garrison on that occasion, to be continued for that time? Ans. 2400

12. If 9600 men have provisions to serve 6 months, how long will the same provisions last 7200 men? Ans. 8 months

13. If a pasture serves 48 horses 18 weeks, how many horses must be turned in to eat up the same in 8 weeks? Ans. 108 horses.

14. If a pasture serves 108 horses 8 weeks, how many weeks will it serve 48 horses? Ans. 18 weeks

15. If 68 masons built a fort in 14 days, to preserve the soldiers from the enemy, how many men must be set to build the same in 4 days? Ans. 238 masons

16. If 238 men build a fortification in 4 days, in how many days will 68 men build it? Ans. 14 days

17. How many yard of paper 27 inches wide, will hang that measures 69 feet round and 7 feet 3 inches high? Ans. 74 yds. 4 inches

18. I desire to know the height of that room whose circumference is 69 feet, and takes 74 yards, 4 inches of paper 27 inches wide to hang it? *Ans.* 87 inches

19. Suppose 550 yards of cloth, 5 quarters wide, will make coats for 260 men, how many yards of shalloon, 3 qrs. wide will line them? *Ans.* $916\frac{2}{3}$ yards

20. Suppose I have 550 yards of cloth which takes $916\frac{2}{3}$ yards of shalloon, 3 quarters wide to line it, I desire to know its breadth? *Ans.* 5 qrs.

21. In what time will 1200*l* gain 100*l* interest, when 160*l* does it in 30 years? *Ans.* 4 years

22. If 1200*l* gain 100*l* interest in 4 years, how many pounds must I put out to gain the same in 30 years? *Ans.* 160*l*

23. Suppose 400*l* would defray the expences of 20 men for 87 weeks and 3 days, how long will 12 men be in spending the same sum, at the same rate of living? *Ans.* 145 weeks 5 days

24. If 12 men spend 400*l* in 145 weeks 5 days, how many men will spend the same sum in 87 weeks 3 days, they living at the same rate? *Ans.* 20 men

25. If 1 acre of land contains 20 perches in length and 8 in breadth, how many perches must there be in length when the breadth is only 3 perches? *Ans.* $53\frac{1}{3}$ per. in length

26. If $53\frac{1}{3}$ perches long and 3 broad, are contained in an acre of land, what must be the breadth when the length is 20 perches? *Ans.* 8 perches broad

27. Suppose I have a right of common for 200 sheep 80 days, how long may I turn on 800 sheep? *Ans.* 20 days

28. Suppose I have a right of common for 800 sheep 20 days, how many sheep may I turn on 80 days? *Ans.* 200

29. If a parcel of hay will keep 45 head of cattle 4 weeks, how long will it keep 30 head of cattle, feeding at the same rate? *Ans.* 6 weeks

30. If a parcel of hay will keep 30 cattle 6 weeks, how many will eat the same quantity in 4 weeks? *Ans.* 45

31. How many yards of matting that is 2 feet 6 inches wide, will cover a floor that is 18 feet long, and 16 feet 3 inches wide? *Ans.* 39 yards

32. What is the breadth of that floor whose length is 18 feet, and takes 39 yards of matting that is 2 feet 6 inches wide to cover it? *Ans.* 16 ft. 3 inches

33. If for 40 shillings I have 15 cwt. 2 qrs. 8 lb. carried 80 miles, how much weight can I have carried 60 miles for the same money?

Ans. 20 cwt. 3 qrs. $1\frac{1}{2}$ lb.

34. If for 40 shillings I have 20 cwt. 3 qrs. $1\frac{1}{2}$ lb. carried 60 miles, how many miles can I have 15 cwt. 2 qrs. 8 lb. carried for the same money?

Ans. 80 miles

35. There is a vessel, having a cock, which will empty it in 3 hours, I demand how many cocks of the same capacity there must be to empty the said vessel in $7\frac{1}{2}$ minutes?

Ans. 24

36. There is a vessel having 24 cocks, which will empty it in $7\frac{1}{2}$ minutes, in what time will one cock of the same capacity empty it?

Ans. 3 hours

37. What weight will a man be able to raise who presses with the force of a hundred and three quarters, on the end of an equipoised hand-spike 120 inches long, which is to meet with a convenient prop exactly 8 inches above the other end of the machine?

Ans. 2744 lb

38. How long must the lever be if a man that presses with a force of $1\frac{1}{4}$ cwt. is able to raise a weight of 2744 lb. provided it meets with a convenient prop 8 inches above the other end of the lever?

Ans. 120 inches long

39. There are two equal parallelograms, the length of one is 9 feet 6 inches, and its breadth 5 feet 2 inches; the breadth of the other is 3 feet 4 inches; what is its length?

Ans. 14 ft. $8\frac{7}{10}$ inches

40. Two equal parallelograms given, the length of one is 14 feet $8\frac{7}{10}$ inches, and its breadth 3 feet 4 inches; the length of the other is 9 feet 6 inches; what is its breadth?

Ans. 5 feet 2 inches

41. If a field will keep 9 horses 7 weeks, how long will it keep 21 horses?

Ans. 3 weeks

42. If a field will keep 21 horses 3 weeks, how many horses will eat up the same in 7 weeks?

Ans. 9 horses

COMPOUND PROPORTION,

Teacheth how from 5, 7, 9, 11; &c. conditional terms given, to find a 6, 8, 10, 12, &c. term respectively.

RULE 1.—Place the terms of supposition one above another, in the first place, and the terms of demand one above another, in the third place.

2. Let that term be put in the second place which is of the same denomination with the term sought, using the second term in common, for each of them.

3. The first and third term of every row will be of one name, and must be reduced to the same denomination.

4. Examine every row separately, by saying, if the first term give the second, does the third require more or less? if it requires *more*, mark the *less* extreme; but if *less* mark the *greater* extreme.

5. Multiply all those numbers together which are marked for a divisor, and those which are not marked for a dividend, and the quotient will be the answer sought.

EXAMPLES. (Page 131—143.)

Ex. 1. If 16 horses eat up 9 bushels of oats in 6 days, how many horses would eat up 24 bushels in 8 days?

B.	H.	B.
9	16	24
6d.	—	8d.
9	24	
8	16	
—	—	
72	384	
	6	
	—	
	9)2304	
	—	
	8)256	
	—	
	32 Horses, ans.	

2. If 32 horses eat up 24 bushels of oats in 8 days, how many bushels will 16 horses eat in 6 days? Ans. 9

3. If 24*l.* pay 40 soldiers for working on a fortification 36 days, how much will pay an army consisting of 1500 soldiers, for working on the same fortification 32 days? Ans. 800*l.*

4. If 800*l.* pay 1500 men for working on a fortification 32 days, how many men will 24*l.* pay for working on the same fortification 36 days? Ans. 40

5. A deal merchant bought 9000 deals, of 14 feet long, and $2\frac{1}{2}$ inches thick, how many deals are they equivalent to, 12 feet long, and $1\frac{1}{2}$ inch thick? Ans. 17500

6. A deal merchant bought 17500 deals, 12 feet long, and $1\frac{1}{2}$ inch thick, how many deals are they equivalent to, 14 feet long, and $2\frac{1}{2}$ inches thick. Ans. 9000

7. A garrison, consisting of 19000 men, have bread to allow each man 15 ounce a day, for 32 weeks; now suppose they are reduced to 10000 men, how much must they have a piece to last them 48 weeks? Ans. 120*z.*

8. If a garrison, consisting of 10000 men, have bread enough to allow each man 12 ounces a day for 48 weeks, how much must 12000 men have a piece per day, to last them 32 weeks? Ans. 50*z.*

9. If 36*l.* be the wages of 27 men for 24 weeks, what will be the wages of 72 men for 48 weeks? Ans. 192*l.*

10. If 72 students spend 192*l.* in 48 weeks, how much will serve 27 students 24 weeks? Ans. 36*l.*

11. If 100*l.* at interest for 365 days, gain 5*l.* how much will 144*l.* gain at interest for 486 days? Ans. 9*l.* 11*s.* $8\frac{3}{4}$ $\frac{137}{365}$ *d.*

12. If 144*l.* at interest for 486 days gain 9*l.* 11*s.* $8\frac{3}{4}$ $\frac{137}{365}$ *d.* what will 100*l.* gain in 305 days? Ans. 5*l.*

13. If 12 pennyworth of wine be sufficient for 8 persons at a meal, when wine is 6*d.* per quart, how much wine, at 4*d.* per quart, will be sufficient for 40 persons? Ans. 40*d.*

14. If 100*l.* in 12 months gain 5*l.* interest, what principal will gain 10*l.* in 8 months? Ans. 300*l.*

15. If 300*l.* in 8 months gain 10*l.* interest, what principal will gain 5*l.* in 12 months? Ans. 100*l.*

16. If 248 men in 5 days, each 11 hours long, dig out part of a canal of 7 degrees of hardness, 232 yards long, 4 wide,

wide, and 3 deep; in how many days of 9 hours long, will 24 men dig out a part of the said canal, of 4 degrees of hardness, 337 yards long, 5 wide, and 4 deep?

Ans. $267\frac{1}{2}$ days.

17. If 4 compositors, in 16 days, of 12 hours long each, can compose 14 sheets of 24 pages in each sheet, 44 lines in a page, and 40 letters in a line; how many days of 10 hours long each, will it take 9 compositors (all working together, at the same rate with the former, and on the same sized letter) to compose a volume, or book, to be printed, consisting of 30 sheets, 16 pages in a sheet, 50 lines in a page, and 45 letters in a line?

Ans. $15\frac{4}{7}$ days.

PRACTICE,

Is a contraction of the Rule of Three Direct, when the first term is an unit or one, and is of great use to merchants and tradesmen, being a concise method of working most questions that occur in trade and business.

TABLES.

The even Parts of Money.

<i>Of a Pound.</i>				<i>Of two Shil.</i>				<i>Of a Shil.</i>				<i>Of a Penny.</i>			
s.	d.	is		d.	is			d.	is			qrs.	is		
10	0	is	$\frac{1}{2}$	12	is	$\frac{1}{2}$		6	is	$\frac{1}{2}$		2	is	$\frac{1}{2}$	
6	8	-	$\frac{1}{3}$	8	-	$\frac{1}{3}$		4	-	$\frac{1}{3}$		1	-	$\frac{1}{4}$	
5	0	-	$\frac{1}{4}$	6	-	$\frac{1}{4}$		3	-	$\frac{1}{4}$					
4	0	-	$\frac{1}{5}$	4	-	$\frac{1}{6}$		2	-	$\frac{1}{6}$					
3	4	-	$\frac{1}{6}$	3	-	$\frac{1}{8}$		1 $\frac{1}{2}$	-	$\frac{1}{8}$					
2	6	-	$\frac{1}{8}$	2	-	$\frac{1}{12}$		1	-	$\frac{1}{12}$					
2	0	-	$\frac{1}{10}$	1 $\frac{1}{2}$	-	$\frac{1}{16}$									
1	8	-	$\frac{1}{11}$	1	-	$\frac{1}{24}$									
1	0	-	$\frac{1}{20}$												

Parts of a Shil.
will serve for
Parts of a
Foot.

The even Parts of Weight.

Of a Ton.	Of a Hundred.	Of $\frac{1}{2}$ a Hund.	Of $\frac{1}{4}$ a Hund.
C.	qrs. lb.	lb.	lb.
10 is $\frac{1}{2}$	2 or 56 is $\frac{1}{2}$	14 is $\frac{1}{4}$	14 is $\frac{1}{8}$
5 - $\frac{1}{4}$	1 — 28 - $\frac{1}{4}$	8 - $\frac{1}{7}$	7 - $\frac{1}{4}$
4 - $\frac{1}{5}$	0 — 16 - $\frac{1}{7}$	7 - $\frac{1}{8}$	4 - $\frac{3}{7}$
2 $\frac{1}{2}$ - $\frac{1}{8}$	0 — 14 - $\frac{1}{8}$	3 $\frac{1}{2}$ - $\frac{1}{8}$	3 $\frac{1}{2}$ - $\frac{1}{8}$
2 - $\frac{1}{16}$	0 — 8 - $\frac{1}{14}$	2 - $\frac{1}{28}$	
1 - $\frac{1}{20}$	0 — 7 - $\frac{1}{16}$	1 - $\frac{1}{36}$	
	0 — 4 - $\frac{1}{28}$		
	0 — 3 $\frac{1}{2}$ - $\frac{1}{32}$		
	0 — 2 - $\frac{1}{36}$		
	0 — 1 $\frac{3}{4}$ - $\frac{1}{64}$		

R U L E I.

If the given price be an aliquot part of a penny, shilling, two shillings, or a pound, divide by the aliquot parts, and the quotient will be the answer in pence, shillings, or pounds, respectively.

EXAMPLES. (Page 144.)

Ex. 1. What will 1644 yards of tape come to at $\frac{1}{4}d.$ per yard?

By Proportion.

4 | 1644 at $\frac{1}{4}d.$

1 : $0\frac{1}{4}$:: 1644

12 | 411

4) 1644

210 | 314 3d.

12) 411

£. 1 14 3 Ans.

210) 314 3d.

£. 1 14 3 Ans.

2. What will 2446 pounds of copperas come to at $\frac{1}{2}d.$ per pound?

Ans. £. 5 1 11

3. What will 1426 pounds come to at $\frac{3}{4}d.$ per pound?

Ans. £. 4 9 1 $\frac{1}{2}$

4.

4. What will 1436 pounds of whiting come to at 1d per pound ?
Ans. £.5 19 8
5. What will 3224 ounces of tobacco come to at 1½d per ounce ?
Ans. £.20 3
6. What will 3640 yards of filletting come to at 2d per yard ?
Ans. £.30 6 8
7. What will 642 pounds of rice come to at 3d per pound ?
Ans. £.8 0 6
8. What will 3641 pounds of sugar come to at 4d per pound ?
Ans. £.60 13 8
9. What will 341 pounds of raisins come to at 6d per pound ?
Ans. £.8 10 6
10. If 1 pound of butter cost 8d what will 346 pound cost ?
Ans. £.28 16 8
11. How much must I pay for 842 pounds of coffee at the rate of 2s per pound ?
Ans. £.84 4 0
12. What must be given for 480 yards of cloth at 2s 6d per yard ?
Ans. £.60 0 0
13. What comes 962 ells of Irish cloth to at 3s 4d per ell ?
Ans. £.160 6 8
14. If 1 gallon of oil cost 4s what will 4060 gallons cost ?
Ans. £.812 0 0
15. What will 120 yards come to at 5s per yard ?
Ans. £.30 0 0
16. If 1 ton of coals cost 6s 8d what will 904 tons cost ?
Ans. £.301 6 8
17. What will 4116 yards of cloth come to at 10s per yard ?
Ans. £.2058 0 0

R U L E II.

If the given price be no aliquot part of a penny, shilling, or pound, divide it into several aliquot parts of a penny, shilling, or pound, or of one another, and the sum of the quotients belonging to each aliquot part is the answer required.

EXAMPLES. (Page 148.)

Ex. 18. What will 2800 pounds of whiting come to at 1½d per pound ?

d.

		By Proportion.	
$d.$			
$1 = \frac{1}{12}$	2800 at $1\frac{1}{2}d$	$1 : 1\frac{1}{2} :: 2800$	
		$\frac{4}{5}$	$\frac{5}{4}$
$\frac{1}{4} = \frac{1}{4}$	$\frac{233}{58} \frac{4d.}{4d.}$	5	$4)14000$
	210		$12)3500$
	$\frac{2911}{14} \frac{8}{11} \frac{8}{8} \text{ Ans.}$		$210)2911 \quad 8d.$
			$\underline{\underline{\pounds. 14 \quad 11 \quad 8d. \text{ Proof.}}}}$

19. What will 342 pounds of salt come to at $1\frac{1}{2}d$ per pound? Ans. $\pounds. 2 \quad 9 \quad 10\frac{1}{2}$
20. If 1 ounce of tea cost $2\frac{1}{2}d$ what will 94 ounces cost? Ans. $17s. 7\frac{1}{2}d.$
21. If 1 yard of tape cost $2\frac{1}{2}d.$ what will 342 yards cost? Ans. $\pounds. 3 \quad 11 \quad 3$
22. What will 432 yards come to at $2\frac{1}{2}d$ per yard? Ans. $\pounds. 4 \quad 19 \quad 0$
23. What will 482 ounces of coffee come to at $3\frac{1}{2}d$ per ounce? Ans. $\pounds. 6 \quad 10 \quad 6\frac{1}{2}$
24. If 1 pound of copperas cost $3\frac{1}{2}d$ what will 481 pound cost? Ans. $\pounds. 7 \quad 0 \quad 3\frac{1}{2}$
25. What comes 4120 pounds of currants to at $3\frac{1}{2}d$ per pound? Ans. $\pounds. 64 \quad 7 \quad 6$
26. What will 640 yards of canvas come to at $4\frac{1}{2}d$ per yard? Ans. $\pounds. 11 \quad 6 \quad 8$
27. What will 423 yards of matting come to at $4\frac{1}{2}d$ per yards? Ans. $\pounds. 7 \quad 18 \quad 7\frac{1}{2}$
28. If 1 pound of sugar cost $4\frac{1}{2}d$ what will 246 pound cost? Ans. $\pounds. 4 \quad 17 \quad 4\frac{1}{2}$
29. If 1 pound of raisins cost $5d$ what will 1412 pounds cost? Ans. $\pounds. 29 \quad 8 \quad 4$
30. What will 2160 pounds of soap come to at $5\frac{1}{2}d$ per pound? Ans. $\pounds. 47 \quad 5 \quad 0$
31. What will 3240 pounds of sugar come to at $5\frac{1}{2}d.$ per pound? Ans. $\pounds. 74 \quad 5 \quad 0$
32. What will 2134 pounds of soap come to at $5\frac{1}{2}d$ per pound? Ans. $\pounds. 51 \quad 2 \quad 6$
33. If 1 pound of hops cost $6\frac{1}{2}d$ what will 1204 pound cost at that rate? Ans. $\pounds. 31 \quad 7 \quad 1$

34. What will 496 pounds come to at $6\frac{1}{2}d$ per pound?
 Anf. £.13 8 8
35. What will 984 yards of ribbon come to at $6\frac{1}{4}d$ per yard?
 Anf. £.27 13 6
36. What will 842 pounds of candles come to at $7d$ per pound?
 Anf. £.24 11 2
37. What will 436 ounces of tea come to at $7\frac{1}{2}d$ per ounce?
 Anf. £.13 3 5
38. What will 4160 dozen of tops come to at $7\frac{1}{2}d$ per dozen?
 Anf. £.130 0 0
39. What will 896 dozen of buttons come to at $7\frac{1}{4}d$ per dozen?
 Anf. £.28 18 8
40. If 1 pound of candles cost $8d$ what will 4960 pounds cost?
 Anf. £.165 6 8
41. If 1 yard of lace cost $8\frac{1}{4}d$ what will 960 yards cost?
 Anf. £.33 0 0
42. What will 842 yards of ribbon come to at $8\frac{1}{2}d$ per yard?
 Anf. £.29 16 5
43. What will 123 pair of buckles come to at $8\frac{1}{4}d$ per pair?
 Anf. £.4 9 8 $\frac{1}{2}$
44. What will 842 pounds of sugar come to at $9d$ per pound?
 Anf. £.31 11 6
45. If 1 pound of butter cost $9\frac{1}{4}d$ what will 786 pound cost?
 Anf. £.30 5 10 $\frac{1}{2}$
46. What will 1212 pounds of salt petre come to at $9\frac{1}{2}d$ per pound?
 Anf. £.47 19 6
47. What will 644 pounds of cocoa come to at $9\frac{1}{4}d$ per pound?
 Anf. £.26 3 3
48. At $10d$ per pound, what comes 596 pounds to?
 Anf. £.24 16 8
49. What will 742 yards of tammy come to at $10\frac{1}{4}d$ per yard?
 Anf. £.31 13 9 $\frac{1}{2}$
50. What will 412 yards of blond lace come to at $10\frac{1}{4}d$ per yard?
 Anf. £.18 0 6
51. What comes 680 pounds of logwood to at $10\frac{1}{4}d$ per pound?
 Anf. £.30 9 2
52. If 1 pound of butter cost $11d$ what will 1234 pounds cost?
 Anf. £.56 11 2
53. If 1 cream cheese cost $11\frac{1}{2}d$ what will 3620 cost?
 Anf. £.169 13 9
54. What

54. What will 684 pounds of double refined sugar come to at $11\frac{1}{2}d$ per pound? Ans. £.32 15 6

55. What will 962 pounds of hops come to at $11\frac{3}{4}d$ per pound? Ans. £.47 1 11 $\frac{1}{2}$

R U L E III.

If there be shillings in the price, multiply the given quantity by the number of them, and for the odd money (if any) take the greatest even part of a shilling, and for what is wanting take parts of that part, and add them together, the whole reduced into pounds is the answer.

EXAMPLES. (Page 160.)

Ex. 56. What will 642 yards of cloth come to at $1s\ 7d$ per yard?

		By Proportion.
6 = $\frac{1}{2}$	642 at $1s\ 7d$.	1 : 1. 7 :: 642
1 = $\frac{1}{8}$	321	12 19
	53 6d.	— —
	210	19 12)12198
	101 6 6	— —
	—	210)101 6 6d.
£.	50 16 6 Ans.	— —
	—	£. 50 16 6 Proof.
		— —

57. What will 1241 dozen of lemons come to at $2s\ 5d$ per dozen? Ans. £.149 19 1

58. What will 468 hundred of Lisbon lemons come to at $3s\ 8d$ per hundred? Ans. £.89 2 0

59. What will 642 dozen of pomegranates come to at $4s\ 3d$ per dozen? Ans. £.136 8 6

60. What will 543 dozen of worsted stockings come to at $5s\ 11d$ per dozen? Ans. £.160 12 9

61. If a pair of silk gloves cost $6s\ 10\frac{1}{2}d$ what will 48 pair cost? Ans. £.16 10 0

62. What will 412 gallons of lucca oil come to at $7s\ 7d$ per gallon? Ans. £.156 4 4

63. What will 141 yards of taffaty come to at $8s\ 3\frac{1}{4}d$ per yard? Ans. £.58 6 2 $\frac{1}{2}$

64. What

64. What will 364 yards of cloth come to at 9s 7½d per yard? Ans. £.175 3 6
65. What will 891 yards of muslin come to at 10s 5½d per yard? Ans. £.464 19 9½
66. What will 401 yards of paduasoy come to at 11s 9½d per yard? Ans. £.236 8 5½
67. What will 481 yards of broad cloth come to at 12s 8d per yard? Ans. £.304 12 8
68. If 1 dozen of red port wine cost 13s 6d what must be given for 801 dozen? Ans. £.540 13 6
69. What will 482 quarters of barley come to at 14s 8d per quarter? Ans. £.353 9 4
70. What will 321 quarters of malt come to at 15s 9d per quarter? Ans. £.252 15 9
71. What will 218 dozen of sheep skins come to at 16s 10d per dozen? Ans. £.183 9 8
72. What will 466 dozen of calf skins come to at 17s 4d per dozen? Ans. £.403 17 4
73. What will 621 yards of cloth come to at 18s 6d per yard? Ans. £.574 8 6
74. What will 123 firkins of butter come to at 19s 10½d per firkin? Ans. £.122 4 7½

R U L E IV.

If there be pounds in the price, multiply the given quantity by the number of them, and for the odd money find its produce by the former rules, and add them together for the answer.

EXAMPLES. (Page 167.)

Ex. 75. If 1 hundred weight of Malaga raisins cost 1l 10s what will 112 cwt. cost?

$$\begin{array}{r|l}
 10 = \frac{1}{2} & 112 \text{ at } 1l. 10s. \\
 & 56 \\
 \hline
 \text{£.} & 168 \text{ Ans.} \\
 & \hline
 \end{array}$$

By Proportion.

$$\begin{array}{rcl}
 1 : 1 & 10 :: 112 \\
 20 & & 30 \\
 \hline
 30 & 210 & 33610
 \end{array}$$

£. 168 Proof.

76. What will 412 cwt. of currants come to at 1/ 16s 7d per cwt. Ans. £.753 12 4
77. What will 244 hhds. of sugar come to at 2/ 10s per hhd? Ans. £.610 0 0
78. What will 321 cwt. of double refined sugar come to at 3/ 15s per cwt? Ans. 1203 15 0
79. What will 412 hhds. of tobacco come to at 4/ 16s per hhd? Ans. £.1977 12
80. What will 146 casks of wine come to at 5/ 6s 6½d per cask? Ans. £.777 15 1
81. What will 432 hhds. of oil come to at 6/ 7s 6d per hhd? Ans. £.2754 0 0
82. What will 96 anchors of brandy come to at 7/ 15s per anchor? Ans. £.744 0 0
83. What will 100 hhds. of ale come to at 8/ 16s 4d per hhd? Ans. £.881 13 4
84. If 1 ton of wine cost 12/ 10s what will 220 tons cost? Ans. £.2750 0 0
85. What will 421 hhds. of sugar come to at 17/ 13s per hhd? Ans. £.7430 13 0
86. What will 48 pipes of wine come to at 18/ 19s per pipe? Ans. £.909 12 0

R U L E V.

If the price be any even number of shillings, multiply the quantity by half the number, doubling the first figure of the product for shillings, the rest are pounds.

EXAMPLES. (Page 171.)

87. What will 124 pounds of tobacco come to at 2s per pound?

$$\begin{array}{r}
 \text{lb.} \\
 124 \text{ at } 2s. \\
 \underline{1} \\
 \text{£.12 } 8 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{Otherwise.} \\
 \begin{array}{rcccl}
 \text{lb.} & s. & & \text{lb.} & \\
 1 & : & 2 & :: & 124 \\
 & & & & \underline{2} \\
 & & & & 240 \\
 & & & & \underline{24} \\
 & & & & 264
 \end{array} \\
 \text{£.12 } 8 \text{ Proof.}
 \end{array}$$

88. What

88. What will 222 gallons of oil come to at 4s per gallon?
Ans. £.44 8 0
89. What will 683 yards of cloth come to at 6s per yard?
Ans. £.204 18 0
90. What will 482 ells of holland come to at 8s per ell?
Ans. £.192 16 0
91. What will 422 gross of buttons come to at 10s per gross?
Ans. £.211 0 0
92. What will 683 yards of silk come to at 12s per yard?
Ans. £.409 16 0
93. What will 684 reams of paper come to at 14s per ream?
Ans. £.478 16 0
94. What will 322 yards of broad cloth come to at 16s per yard?
Ans. £.257 12 0
95. What will 344 sheep come to at 18s per sheep?
Ans. £.309 12 0
96. What will 242 dozen of calf skins come to at 34s per dozen?
Ans. £.411 8 0
97. Bought 364 hhd. of cyder at 56s per hhd. what did the whole lie me in?
Ans. £.1019 4 0
98. Sold 482 cwt. of sugar at 80s per cwt. what did the whole amount to?
Ans. £.1928 0 0
99. What will 365 pair of silk stockings come to at 11s per pair?
Ans. £.200 15 0
100. What must be given for 246 pounds of tea at the rate of 17s per pound?
Ans. £.209 2 0
101. If 1 ton of coals cost 6s 8d what will 690 tons cost?
Ans. £.230 0 0

R U L E VI.

When the given quantity consists of several denominations, value the whole numbers by some of the former rules, and for the odd weight or measure, take parts of the given price and add them together.

Or when the given quantity is not very large, multiply the price by the number of integers, and take parts for the odd weight or measure, and add them together for the answer.

EXAMPLES. (Page 173.)

✓ Ex. 102. What will 4 cwt. 1 quarter of raisins come to at 1/5s per cwt?

qr. lb.	£. s.	qr.	£. s.
1 0 = $\frac{1}{4}$	1 5 at 1/5s.	1 = $\frac{1}{4}$	Otherwise.
	4		1 5
	5 0		<u>0 6 3</u>
	0 6 3		cwt.
£.	<u>5 6 3</u> Ans.	5 = $\frac{1}{4}$	4
			1
			<u>0 6 3</u>
		£.	<u>5 6 3</u> Proof.

✓ 103. Bought 3 cwt. 2 qrs. 14 lbs. of cheese at 2/6s 4d per cwt. what did the whole lie me in? Ans. £.8 7 11½

✓ 104. What will 72 cwt. 3 qrs. 21 pounds of sugar come to at 6/16s per cwt? Ans. £.495 19 6

✓ 105. What will 37 cwt. 3 qrs. 21 pounds of tobacco come to at 6/16s per cwt? Ans. £.257 19 6

✓ 106. What will the freight of 113 tons 18 cwt. 3 qrs. of indigo amount to at 19/19s per ton? Ans. £.2273 1 0½

✓ 107. What is the value of 2 qrs. 21 pounds of double refined sugar at 3/5s 4d per cwt. Ans. £.2 4 11

✓ 108. Bought 17 pound of indigo at 6/10s 8d per cwt. what doth it come to? Ans. 19s 10d

✓ 109. What will 781 cwt. 3 qrs. 4 pounds of sugar come to at 1/17s 4d per cwt? Ans. £.1459 6 8

✓ 110. What cost the freight of 542 tons 15 cwt. at 6/16s 4½d per ton? Ans. £.3700 17 6½

✓ 111. What will 12 pounds 10 ounces 15 dwts. 12 grs. of silver come to at 3/6s per pound? Ans. £.42 11 3 0¾ qrs.

✓ 112. What is the rent of 1426 acres 3 rods 20 perches of land, at 3/17s 6d per acre? Ans. £.5529 2 9½

R U L E VII.

If the given quantity hath a fraction annexed, value the whole number as before, and for the fraction, multiply the price

price by the numerator, and divide that product by the denominator; the quotient is the value of the fraction, and must be added to the value of the whole number.

EXAMPLES (Page 176.)

Ex. 113. What will $716\frac{3}{8}$ ells of Holland come to at 6s 11d per ell?

$$\begin{array}{r|l}
 d. & \\
 6 = \frac{1}{2} & 716\frac{3}{8} \\
 & \underline{6} \\
 & 4296 \\
 3 = \frac{1}{2} & 358 \\
 1\frac{1}{2} = \frac{1}{2} & 179 \\
 \frac{1}{2} = \frac{1}{2} & 89 \quad 6d \\
 & \underline{29 \quad 10} \\
 & \underline{2 \quad 7\frac{1}{8}} \\
 210 & 49514 \quad 11\frac{1}{8}d. \\
 \text{£.} & \underline{247 \quad 14 \quad 11\frac{1}{8} \text{ anf.}}
 \end{array}$$

$$\begin{array}{r}
 s. \quad d. \\
 6 \quad 11 \\
 \underline{\quad 3} \\
 8)1 \quad 0 \quad 19 \\
 \underline{\quad \quad 8} \\
 \text{£. } 0 \quad 2 \quad 7\frac{1}{8}
 \end{array}$$

114. What will $265\frac{1}{2}$ yards of cloth come to at 14s per yard? Anf. 186l 6d

115. What will $358\frac{3}{8}$ yards of broad cloth come to at 17s per yard? Anf. 304l 12s 4 $\frac{1}{2}$ d

116. What will $964\frac{5}{8}$ yards come to at 8s 10 $\frac{1}{2}$ d per yard? Anf. 428l 15 0 $\frac{1}{2}$ $\frac{2}{3}$ d

117. What will $186\frac{3}{8}$ ells come to at 1l 12s 6 $\frac{1}{2}$ d per ell? Anf. 303l 12s 3 $\frac{1}{4}$ $\frac{1}{2}$ d

R U L E VIII.

When the price hath a fraction annexed, work for the pounds, shillings, or pence, by the shortest of the foregoing Rules, and for the fraction multiply the given quantity by the numerator, and divide that product by the denominator, which quotient add to the sum of the whole number for the answer.

EXAMPLES.

EXAMPLES. (Page 177.)

118. What will 908 pounds of tobacco come to at $19\frac{3}{4}d$ per pound?

$$\begin{array}{r}
 1b. \\
 908 \text{ at } 19\frac{3}{4}d \\
 \hline
 19 \\
 17252 \\
 567 \frac{3}{4} \\
 \hline
 12)17819 \frac{1}{2} \\
 \hline
 2)0)14814 \frac{1}{2} \\
 \hline
 \pounds. 74 \text{ } 4 \text{ } 11\frac{1}{2} \text{ ans.}
 \end{array}$$

$$\begin{array}{r}
 908 \\
 5 \\
 \hline
 8)4540 \\
 \hline
 567 \frac{1}{2} \text{ or } \frac{3}{4}d
 \end{array}$$

119. How much sterling must I give for 784 French crowns at $5\frac{3}{4}s$ per crown? Ans. $209l \text{ } 15 \text{ } 4d$

120. What will the carriage of 8372 pounds come to at $\frac{7}{8}$ of a penny per pound? Ans. $30l \text{ } 10s \text{ } 5\frac{1}{2}d$

121. What will 423 yards of tape come to at $\frac{4}{5}$ of a penny per yard? Ans. $1l \text{ } 8s \text{ } 2\frac{2}{3}d$

R U L E IX.

When the given quantity is feet, inches, &c. multiply the length by the number of feet in the breadth, and take aliquot parts for the inches &c. according to the foregoing rules, and add them together for the answer.

EXAMPLES. (Page 178.)

Ex. 1. What is the product of 6 feet 6 inches, by 3 feet 2 inches?

		F.		I.		F. I.		By Duodecimals.	
I.		F.		I.		F.		I.	
$2 = \frac{1}{6}$		6	6	by	3	2	6	6	
			3				3	2	
		19	6				19	6	
		1	1				1	1	0
		20	7	ans.			20	7	0

2. What

2. What is the product of 8 feet 4 inches, by 5 feet 3 inches? Ans. 43 ft. 9 inches
3. What is the product of 12 feet 6 inches, by 8 feet 5 inches? Ans. 105 ft. 2 6
4. A floor is 26 feet 4 inches long, and 12 feet 7 inches broad, how many square feet does it contain? Ans. 331 ft. 4 4
5. How many square feet are there in a room the length of which is 76 feet 6 inches, and breadth 48 feet 3 inches? Ans. 3691 ft. 1 6
6. If a room be 45 feet 6 inches long, and 38 ft. 7 inches broad, how many square feet does it contain? Ans. 1755 ft. 6 6
7. What is the area in square feet of a room, the length of which is 84 feet 2 inches, and breadth 79 feet 2 inches? Ans. 6663 ft. 2 4
8. A partition is 126 feet 6 inches long, and 121 feet 3 inches broad, how many square feet will it contain? Ans. 15338 ft. 1 6
9. If a court be 764 feet 5 inches long, and 192 feet 4 inches broad, how many square feet will it contain? Ans. 147022 ft. 9 8
10. How many square feet are there in a bowling-green, the length of which is 7681 feet 8 inches, and breadth 1926 feet 10 inches? Ans. 14801291 ft. 4 8
11. If a window be 7 feet 3 inches 3 parts long, and 1 foot 7 inches 6 parts broad, how many square feet of glass does it contain? Ans. 11 ft. 9 9 4 6
12. How many square feet of glass are there in a window the length of which is 8 feet 6 inches 6 parts, and breadth 7 feet 3 inches and 4 parts? Ans. 62 ft. 1 11 8
13. If a piece of wainscot be 4 feet 10 inches 6 parts long, and 2 feet 4 inches and 8 parts broad, how many square feet are contained therein? Ans. 11 ft. 7 9
14. How many square feet of painting are there in a partition the length of which is 7 feet 8 inches 6 parts, and breadth 7 feet 2 inches and 8 parts? Ans. 55 ft. 8 0 8
15. What is the content of a table in square feet that is 3 feet $6\frac{1}{4}$ inches long, and 2 feet $4\frac{1}{2}$ inches broad? Ans. 8 ft. 4 4 1 6
16. How

16. How many square feet are contained in a partition that measures 19 feet 2 inches and 10 parts long, and 9 feet 6 inches and 4 parts broad? Ans. 116 ft. 6 11 11 4

17. What is the area, in square feet, of a room that is 76 feet 3 inches 3 parts long, and 84 feet 7 inches 6 parts broad? Ans. 6454 ft. 5 0 4 6

18. How many square feet are there in a wall 87 feet 3 inches and 5 parts long, and 18 feet 1 inch 6 parts high? Ans. 1580 ft. 0 5 1 6

19. If a court yard be 371 feet $2\frac{1}{2}$ inches long, and 181 feet $1\frac{1}{2}$ inches broad, how many square feet doth it contain? Ans. 67223 ft. 7 2 9 9

20. How many square feet are contained in a garden the length of which is 487 feet 10 inches and 10 parts, and breadth 186 feet $5\frac{1}{2}$ inches? Answer. 90973 feet 6 5 7

21. What is the superficial content of a board the length of which is 18 feet 6 inches, and breadth 1 foot 2 inches? Ans. 21 ft. 7

22. If a garden wall be 45 feet 6 inches round, and 9 feet 4 inches high, how many square feet doth it contain? Ans. 424 ft. 8

23. How many square yards of paving are there in a court yard the length of which is 64 feet 6 inches, and breadth 47 feet 8 inches? Ans. 341 yards 5 6

24. How many square yards of paving are there in a street the length of which is 864 feet 3 inches, and breadth 62 feet 6 inches? Ans. 6001 yds. 6 7 6

25. If a ceiling be 60 feet 9 inches long, and 22 feet 3 inches broad, how many yards doth it contain? Ans. 150 yds. 1 8 3

26. How many square yards of painting are contained in a room that measures 40 feet 6 inches in circumference, and 9 feet 3 inches high? Ans. 41 yds. 5 7 6

27. If a window be 3 feet 8 inches 9 parts long, and 1 foot 4 inches 6 parts broad, how many square feet of glass are contained therein? Ans. 5 ft. 1 6 4 6

28. Suppose there was a window with 15 pains of glass each 3 feet $7\frac{3}{4}$ inches long, and 1 foot 5 inches 1 part broad, how many feet of glass doth it contain? Ans. 77 ft. 10 2 11 3

29. How

29. How many solid feet are there in a beam that is 1 foot 6 inches broad, 1 foot 3 inches deep, and length 16 feet 3 inches? Ans. 30 ft. 5 7 6

30. If a beam be 1 foot 5 inches 6 parts, by 1 foot 2 inches 10 parts, and length 12 feet 3 inches 7 parts, how many solid feet doth it contain? Ans. 22 ft. 2 0 6 2 1

TARE AND TREET

By these Rules merchants and tradesmen deduct certain allowances made by them in selling their goods by weight.

TARE is an allowance made to the buyer, for the weight of the box, barrel, bag, &c. which contains the goods bought.

TREET is an allowance of four pounds in every 104 pounds for waste, dust, &c.

CLOFF is an allowance of two pound for every 3 cwt.

GROSS-WEIGHT is the whole weight of any sort of goods, together with the box, barrel, bag, &c. that contains them.

SUTTLE is when part of the allowance is deducted from the gross.

NEAT-WEIGHT is what remains after all allowances are made.

CASE I.

When the tare is at so much per box, barrel, bag, &c.

RULE.

Multiply the number of boxes, or barrels, &c. by the Tare, and subtract the product from the gross, the remainder is the neat weight required.

EXAMPLES.

EXAMPLES. (Page 185.)

Ex. 1. Suppose 6 cwt. 1 quarter 7 pound tare, was allowed on 97 cwt. 1 quarter 8 pound of raisins, what is the neat weight?

	C.	qr.	lb.	
Gross	97	1	8	
Tare	6	1	7	
	<hr/>			
Neat weight	91	0	1	anf.
	<hr/>			
	97	1	8	proof
	<hr/>			

2. What is the neat weight of 8 hogheads of tobacco, each weighing 9 cwt. 2 quarters 8 pounds gross, tare 14 pound per hhd? Ans. 75 cwt. 2 qr. 8 pounds

3. In 14 frails of raisins, each weighing 5 cwt. 2 qrs. 5 pounds gross, tare 23 pounds per frail, how much neat? Ans. 74 cwt. 3 qrs.

4. In 24 barrels of figs, each weighing 1 cwt. 3 quarters 10 pounds gross, tare 10lb. per barrel, how much neat? Ans. 42 cwt.

5. What is the neat weight of 20 bales of silk, each weighing 1 cwt. 2 qr. 13lb. gross, tare 18 pound per bale? Ans. 29 cwt. 12 pounds

CASE II.

When the tare is at so much per hundred weight.

RULE.

Divide the gross weight by the aliquot parts of a cwt. and subtract the quotient from the gross, the remainder is the neat weight.

EXAMPLES. (Page 186.)

Ex. 6. What is the neat weight of 6 barrels of figs, each weighing 4 cwt. 2 quarters, 6 pounds gross, tare 14 pounds per cwt?

	C.	qr.	lb	
	4	2	6	
			6	
14 = $\frac{1}{8}$	27	1	8	gross
	3	1	18	tare
Answer	23	3	18	neat weight.

7. What is the neat weight of 127 hundred weight 3 quarters 14 pounds gross, tare 16 pounds per cwt.?

Ans. 109 cwt. 2 qrs. 12 pounds

8. What is the neat weight of 36 bags of cinnamon, each weighing 2 cwt. 1 qr. 5 pounds gross, tare 7 pounds per cwt.?

Ans. 77 cwt. 1 qr. $21\frac{3}{4}$ pounds

9. What is the neat weight of 3 barrels of indigo, each 7 cwt. gross, tare $10\frac{1}{2}$ pounds per cwt.?

Ans. 19 cwt. 0 qr. $3\frac{1}{2}$ pounds

10. What is the neat weight of 16 hogheads of tobacco, each weighing 5 cwt. 2 qr. 4 pounds gross, tare 21 pounds per cwt.?

Ans. 71 cwt. 3 qr. 24 pounds

C A S E III.

When tret is allowed with tare.

R U L E.

Divide the futtle weight by twenty-six as in compound division, and the quotient is the tret, which subtract from the futtle, the remainder is the neat.

EXAMPLES. (Page 188.)

Ex. 11. If 20 cwt. 1 qr. 4 pounds gross, tare 35 pounds per cwt. tret 4 pounds per 104 as usual, what is the neat weight?

* I

lb.	C. qr. lb.
$28 = \frac{1}{4}$	20 1 4 gross
$7 = \frac{1}{4}$	5 0 8
	1 1 2
	6 1 10 tare
* 26	13 3 22 futtle
	0 2 $4\frac{1}{13}$ tret
Ans.	13 1 $17\frac{12}{13}$ neat wt.
	$104 \div 4 = 26.$

12. What is the neat weight of a puncheon of prunes, gross weight, 6 cwt. 2 qr. 24 pounds, tare 14 pounds per cwt. tret as usual? Ans. 5 cwt. 2 qr. $16\frac{2}{13}$ pounds

13. Suppose a merchant buys 12 hogsheds of tobacco, each weighing 9 cwt. 1 qr. 14 pounds gross, tare 21 pounds per cwt. tret as usual, how much neat? Ans. 87 cwt. 3 qr. $15\frac{3}{4}$ pounds

14. In 8 bags of cotton yarn, each weighing 4 cwt. 2 qr. 7 pounds gross, tare 24 pounds per cwt. tret as usual, how much neat weight? Ans. 27 cwt. 2 qr. $8\frac{6}{13}$ pounds

15. In 28 barrels of indigo, each weighing 2 cwt. 3 qr. 14 pounds gross, tare $24\frac{1}{2}$ pounds per cwt. tret 4 pounds per 104 as usual, how much neat weight? Ans. 60 cwt. 1 qr. $24\frac{3}{4}\frac{2}{8}$ pounds

CASE IV.

When tare, tret, and cloff are all allowed.

RULE.

Deduct the tare and tret, and divide the futtle by 168, the quotient is the cloff, which subtract from the futtle, the remainder is the neat.

EXAMPLES

EXAMPLES. (Page 189.)

Ex. 16. What is the neat weight of 32 cwt. 3 qr. 12 pounds gross, tare 14 pounds per cwt. tret 4 pounds per 104 pounds, and cloff 2 pounds for 3 cwt.?

lb.	C. qr. lb.
14 = $\frac{1}{8}$	32 3 12 gross
	<hr/> 4 0 12 tare
26	28 3 0 futtle
	<hr/> 1 0 11 13 tret
168	27 2 16 3 futtle
	<hr/> 0 0 18 6 cloff
Answer	<hr/> 27 1 25 13 nt. weight

17. What is the neat weight of 64 cwt. 3 qrs. gross, tare 8 pounds per cwt. tret and cloff as usual?

Anf. 50 cwt. 1 qr. 24 lb. 7 $\frac{1}{2}$ ounces

18. In 36 chests of sugar, each weighing 12 cwt. 1 qr. 16 pounds gross, tare 21 pounds per cwt. tret and cloff as usual, how much neat weight?

Anf. 346 cwt. 1 qr. 25 $\frac{1}{2}$ pounds

19. A merchant buys 6 hogsheds of tobacco, each containing 9 cwt. 1 qr. 14 pounds gross, tare 3 qrs. 18 pounds per hoghead, tret and cloff as usual, how much neat weight?

Anf. 48 cwt. 2 qr. 4 lb. 12 ounces

20. In 28 cwt. 2 qr. gross weight of currants how much neat, allowing 18 pounds per cwt. tare, 4 pounds, 104 tret, and 2 pounds per 3 cwt. cloff?

Anf. 22 cwt. 3 qr. 12 $\frac{2}{3}$ pounds

SIMPLE INTEREST,

IS a premium allowed by the borrower of money to the lender; *principal* is the money lent; *rate* is the sum per cent. agreed on, which should not exceed 5%. for the use of one hundred pounds for one year; *amount* is the principal and interest added together.

R U L E.

1. Multiply the principal by the rate, and divide that product by one hundred, the quotient is the answer for one year.
2. Multiply the interest for one year by the time given, the product is the answer for that time.
3. If there is a part of a year, as months or days, find for the even time as before, and for the odd time, take some aliquot part or parts of a year; or if that cannot be done, work by the Rule of Three Direct.

EXAMPLES. (Page 191.)

Ex. 1. What is the interest of 364*l* for 1 year at 5*l* per cent. per annum?

$$\begin{array}{r}
 364 \\
 \times 5 \\
 \hline
 \text{£. } 18 | 20 \\
 \phantom{\text{£. }} 20 \\
 \hline
 \text{s. } 4 | 00 \\
 \hline
 \text{An. £. } 18 \ 4
 \end{array}$$

2. What is the interest of 364*l* for 1 year at 4½*l* per cent. per annum? Ans. 16*l* 7*s* 7½*d*

3. What is the interest of 364*l* for 1 year, at 4*l* per cent. per annum? Ans. 14*l* 11*s* 2½*d*

4. What

4. What is the interest of 500*l* 10*s* 6 $\frac{1}{4}$ *d* for 1 year at 5*l* per cent. per annum? Ans. 25*l* 0*s* 6 $\frac{1}{4}$ *d* $\frac{1}{4}$
5. What is the interest of 862*l* 16*s* 8*d* for 1 year at 4 $\frac{1}{2}$ *d* per cent per annum? Ans. 38*l* 16*s* 6 $\frac{1}{2}$ *d* $\frac{2}{3}$
6. What is the interest of 1000*l* 16*s* 8*d* for 1 year at 4*l* per cent per annum? Ans. 40*l* 0*s* 8*d*
7. What is the interest of 486*l* for 5 years, at 5*l* per cent. per annum? Ans. 121*l* 10*s*
8. What is the amount of 884*l* for 7 years, at 5*l* per cent. per annum? Ans. 1193*l* 8*s* 0*d*
9. What is the amount of 1001*l* for 6 years, at 4 $\frac{1}{2}$ *l* per cent. per annum? Ans. 1271*l* 5*s* 4*d* $\frac{2}{3}$
10. What is the amount of 460*l* for 4 years, at 3 $\frac{1}{4}$ per cent. per annum? Ans. £. 529
11. What is the interest of 924*l* for two months, at 5*l* per cent. per annum? Ans. £. 7 14
12. What is the interest of 1205*l* for 6 months, at 4*l* per cent. per annum? Ans. £. 24 2
13. What is the amount of 640*l* 8*s* 4*d* for 7 years, at 5*l* per cent. per annum? Ans. 864*l* 11*s* 3*d*
14. What is the amount of 9640*l* 16*s* 8*d* for 4 years and 9 months, at 5 per cent. per annum? Ans. 11930*l* 10*s* 7 $\frac{1}{2}$ *d*
15. Lent a friend 20*l* for 13 weeks, what will it amount to at 5*l* per cent. per annum? Ans. 20*l* 5*s*
16. What is the amount of 500*l* for 4 years and 39 weeks, at 5*l* per cent. per annum? Ans. 618*l* 15*s*
17. What is the interest of 641*l* for 50 days, at 5*l* per cent. per annum? Ans. 4*l* 7*s* 9 $\frac{1}{2}$ *d* $\frac{2}{3}$ $\frac{2}{3}$
18. What is the interest of 2000*l* for 63 days, days at 4 $\frac{1}{2}$ per cent. per annum? Ans. 15*l* 10*s* 8 $\frac{1}{2}$ *d* $\frac{6}{7}$
19. What is the amount of 5800*l* 16*s* 8*d* for 260 days at 4*l* per cent. per annum? Ans. 5966*l* 2*s* 4*d* $\frac{1}{3}$ $\frac{2}{3}$
20. What is the interest of 563*l* 12*s* 6 $\frac{1}{2}$ *d* for 265 days, at 5*l* per cent. per annum? Ans. 20*l* 9*s* 2 $\frac{1}{2}$ *d* $\frac{1}{3}$

COMMISSION,

Is an allowance made to factors or agents abroad for buying or selling of goods for their employers.

EXAMPLES (Page 198.)

- Ex. 1. What is the commission of 500*l* at $2\frac{1}{2}$ per cent ?
 Ans. 12*l* 10*s*
2. Suppose I allow my correspondent two per cent. for his commission, what is his demand on the disbursement of 369*l* ?
 Ans. 7*l* 7*s* 7*d* $\frac{1}{3}$
3. What must I allow my factor for the disbursing on my account 748*l* 11*s* 8*d* at 3 per cent. ?
 Ans. 22*l* 9*s* 1*d* $\frac{1}{4}$
4. What is the commission on 1900*l* at $5\frac{7}{8}$ per cent ?
 Ans. 111*l* 12*s* 6*d*

BROKAGE,

Is an allowance of so much per cent. made to brokers for assisting others in buying or disposing of their goods.

EXAMPLES. (Page 199.)

- Ex. 1. What is the brokerage of 640*l* at 5*s* or $\frac{1}{4}$ per cent.
 Ans. 1*l* 12*s*
2. What is the brokerage of 845*l* at 10*s* or $\frac{1}{2}$ per cent. ?
 Ans. 4*l* 4*s* 6*d*
3. If I allow my broker $2\frac{1}{2}$ per cent. what may he demand when he sells goods to the value of 202*l* 1*s* 8*d* ?
 Ans. 5*l* 1*s* 0*d* $\frac{1}{2}$
4. What is the brokerage of 4360*l* 8*s* 4*d* at 3 per cent. ?
 Ans. 130*l* 16*s* 3*d*
5. What is the brokerage of 210*l* 16*s* 8*d* at $3\frac{1}{4}$ per cent ?
 Ans. 7*l* 16*s* 6*d* $\frac{1}{2}$

INSURANCE.

INSURANCE,

Is a security given in consideration of a premium paid down, to restore, to a certain value for which the premium is advanced, the loss or damage on ships, houses, goods, &c. which may happen by storms, fire, &c.

EXAMPLES. (Page 200.)

Ex. 1. What is the insurance of a house and goods, valued at 468*cl* at $10\frac{1}{2}$ per cent. Ans. 49*l* 8*s*

2. What is the insurance of 9000*l* at $10\frac{3}{4}$ per cent ? Ans. 967*l* 10*s*

3. What is the insurance of 782*l* 10*s* at $15\frac{1}{2}$ per cent ? Ans. 121*l* 5*s* 9*d*

4. What is the insurance of 780*l* at $5\frac{3}{8}$ per cent ? Ans. 41*l* 18*s* 6*d*

5. Suppose I shipped goods to the value of 1500*l* and made an insurance at $6\frac{1}{2}$ per cent. what does it come to ? Ans. 97*l* 10*s*

PURCHASING STOCKS.

Stock is a general name for the capitals of our trading companies.

EXAMPLES. (Page 201.)

Ex. 1. What is the purchase of 2680*l* South Sea stock at 110 per cent ?

<i>£</i> .		By Practice.
2680		Per cent.
10		100 = 1) 2680

		10 = $\frac{1}{10}$) 2680
268	100 Int. for excess above 100.	268
2680	Principal	_____
		<i>£</i> . 2948
<u><i>£</i>. 2948</u>	Ans.	_____

2. What is the purchase of 640l 8s India stock at 120l per cent ?
 Ans. 768l 9s 7d $\frac{1}{2}$
3. What is the purchase of 926l bank stock at 130 $\frac{1}{2}$ per cent ?
 Ans. 1208l 8s 7d $\frac{1}{2}$
4. What is the purchase of 1752l bank annuities at 115 $\frac{5}{8}$ per cent ?
 Ans. 2025l 15s
5. What does 1200l capital stock in the 3 per cent. consolidated bank annuities come to at 84 $\frac{1}{8}$ per cent ?
 Ans. 1009l 10s
6. A gentleman bought 1300l bank annuities at 90 $\frac{3}{8}$ per cent. and paid brokage $\frac{1}{8}$ per cent. what did the whole amount to ?
 Ans. 1176l 10s

DISCOUNT,

Is the abatement made by paying a sum of money before it is due.

R U L E.

1. As the amount of one hundred pounds for the given rate and time is to one hundred pounds, so is the given sum or debt to the present worth.
2. Subtract the present worth from the given sum, the remainder is the discount required. Or, as the amount of one hundred pounds for the given rate and time is to the interest of one hundred pounds for that time, so is the given sum or debt to the discount required.

EXAMPLES. (Page 203.)

Ex. 1. What is the discount of 120l for 12 months at 5 per cent ?

Discount.

93

	£.	£.	£.
100	105	5	120
<u>5</u>		<u>5</u>	
5100 Interest		£. s. d.	
	105)600	(5 14 3 $\frac{1}{4}$ 75 Rem.	
	525		
	<u>75</u>		
	20		
	<u>105)1500</u>	(14s.	
	105		
	<u>450</u>		
	420		
	<u>30</u>		
	12		
	<u>105)360</u>	(3d.	
	315		
	<u>45</u>		
	4		
	<u>105)180</u>	(7 $\frac{1}{2}$.	

2. Sold goods to the value of 50/ to be paid in twelve months, what must be discounted for present payment, allowing discount at 5 per cent? Ans. 2/ 7s 7 $\frac{1}{2}$ d 75 rem.

3. What present money will discharge a debt of 200, payable at the end of twelve months, discount being made at 5 per cent? Ans. 190/ 9s 6 $\frac{1}{2}$ d 15 rem.

4. How much ready money for a note of 36/ due 3 months hence, discounted at 5 per cent? Ans. 35/ 11s 1 $\frac{1}{4}$ d 13 $\frac{1}{2}$ rem.

5. What is the discount of 573/ 16s due 3 years hence, discount at 4 $\frac{1}{2}$ per cent? Ans. 68/ 4s 11 $\frac{1}{4}$ d 83 rem.

6. What present money will discharge a debt of 130/ due one year and nine months hence, discount at 4 $\frac{3}{8}$ per cent? Ans. 120/ 15s 1d 546 rem.

7. How much present money must be allowed for a bill of 399/ 13s 4d payable in 73 days, discount being made at 5 per cent? Ans. 395/ 14s 2 $\frac{1}{4}$ d 19 $\frac{1}{2}$ rem.

COMPOUND

COMPOUND INTEREST,

Is that which arises from both principal and interest taken together, as it becomes due at the end of each stated time of payment.

R U L E.

Find the amount of the given principal for the time of the first payment, by simple interest, then consider this amount as the principal for the second payment, whose amount calculate in the same manner, and so on through all the payments, still accounting the last amount as the principal for the next payment.

EXAMPLES. (Page 208.)

Ex. 1. What is the amount of 50*l.* for three years, at 5 per cent per annum, compound interest?

<u>£.</u>	<u>£.</u>	<u>s.</u>	
50	50	0	=first year's principal
5	2	10	=first year's interest
<u>2150</u>	<u>52</u>	<u>10</u>	=second year's principal
20	5		
<u>10100</u>	<u>2162</u>	<u>10</u>	
	20		
	<u>12150</u>	<u>55</u>	<u>2</u>
	12	6	=third year's principal
	<u>6100</u>	<u>2175</u>	<u>12</u>
		20	
		<u>15112</u>	
		12	
		<u>1150</u>	
		4	
		<u>2100</u>	
<u>£.</u>	<u>s.</u>	<u>d.</u>	
55	2	6	=third year's principal
2	15	1½	=third year's interest
<u>£.57</u>	<u>17</u>	<u>7½</u>	Amount. Answer.

2. What is the amount of 100*l* for four years, at 5 per cent. per annum, compound interest? Ans. £.121 11 0 $\frac{3}{4}$

3. What will 100*l* amount to in 4 years at 5 per cent. per annum, compound interest, supposing the interest payable half yearly? Ans. £.121 16 9

4. What will 100*l*. the interest payable quarterly, amount to in 2 years, at 5 per cent. per annum, compound interest? Ans. £.110 8 10 $\frac{1}{2}$

5. What is the compound interest of 450*l* for born five years, at 4 per cent. per annum? Ans. £.97 9 10 $\frac{1}{2}$

EQUATION OF PAYMENTS,

Is the finding a time to pay at once several debts due at different times, so that no loss shall be sustained by either party.

R U L E.

Multiply each payment by the time it is due at, then divide the sum of the products by the sum of the payments, the quotient will be the equated time.

EXAMPLES. (Page 214.)

Ex. 1. A owes B 200*l* to be paid as follows, viz. 100*l* in 4 months, and 100*l* in 6 months, but if it be reduced to one payment, at what time must it be made?

£.	£.
100	100
4	6
<hr/>	<hr/>
400	600
	400
	<hr/>
	2100)10100
	<hr/>

Ans. 5 months.

2. A debt is to be discharged thus, viz. 200*l* present, 600*l* at 4 months, and the rest at 6 months, what is the equated time for the whole? Ans. 3 $\frac{1}{2}$ months

3. A

3. A debt of 240/ due as follows, viz. 100/ at 2 months, 80/ at 5 months, and the rest at seven months, when must the whole be paid? Ans. $4\frac{1}{4}$ months

4. A debt of 700/ is to be discharged thus, 100/ in 2 months, 200/ in 4 months, 300/ in 6 months, and the rest in 12 months, what is the equated time for the whole? Ans. $5\frac{3}{7}$ months

5. A tradesman hath owing him 900/ to be paid as follows, viz. 100/ at 4 months, 200/ at 5 months, and the rest at 12 months, but they agree to have but one payment of the whole, at what time must it be made? Ans. $9\frac{5}{8}$ months

6. A father left his son 1200/ to be paid thus, one-third in 3 months, one-third in 4 months, and one-third in 8 months, but the executor agrees with the youth to pay it him all together, when must the payment be made? Ans. in 5 months

BARTER,

Is the exchanging of one commodity for another, so that neither party may sustain loss.

R U L E.

Find the value of that commodity whose quantity is given, then find what quantity of the other, at the rate proposed, you may have for the same money, the quantity is the answer.

EXAMPLES. (Page 215.)

Ex. 1. How many pounds of raisins, at 6d per pound, must I give in barter for 30 pounds of tobacco at 2s per pound?

$$\begin{array}{rcl} \text{lb.} & \text{s.} & \text{lb.} \\ 1 & : 2 & :: 30 \\ & & 2 \end{array}$$

$$\begin{array}{r} 20 \overline{)60} \\ \underline{} \\ \text{£} 3 \end{array}$$

$$\begin{array}{rcl} \text{d.} & \text{lb.} & \text{£.} \\ 6 & : 1 & :: 3 \\ & & 20 \end{array}$$

$$\begin{array}{r} 60 \\ 12 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \overline{)720} \\ \hline \end{array}$$

$$\text{lb. } 120 \text{ Ans.}$$

2. How many pounds of tobacco at 2s per pound, must I receive in barter for 120 pounds of raisins at 6d. per pound?

Ans. 30 pounds

3. What quantity of tea at 8s per pound, must I give in barter for 2 cwt. of coffee at 2s per pound?

Ans. 56 pounds

4. What quantity of coffee at 2s per pound, must I give for 56 pounds of tea at 8s per pound?

Ans. 2 cwt.

5. A delivered 252 yards of cloth at 3s per yard to B for 6 hhd. of wine, what was the wine per gallon?

Ans. 3s 4d

6. B delivered 6 hhd. of wine at 3s 4d per gallon, to A for 252 yards of cloth, what was the cloth per yard?

Ans. 5s

7. A hath cloth at 8s 4d per yard, ready money, but in barter will have 10s per yard; B hath hops worth 20d per pound, ready money, how must B rate his hops per pound, that his profits may be equal to A's?

Ans. 2s per lb.

8. B hath hops at 20d per pound, ready money, but in barter will have 2s per pound; A hath cloth worth 8s 4d per yard, ready money, how must A rate his cloth per yard, that his profit may be equivalent with B's?

Ans. 10s per yard

9. A and B barter, A hath 82 cwt. of cheese, at 30s per cwt. for which B gives him 20l in money, and the rest in raisins at 5d per pound, what quantity of raisins must A receive?

Ans. 44 cwt. 0 qr. 16 pounds

10. B and A barter, B hath 44 cwt. 16 pounds of raisins at 5d per pound, which he gives to A and 20l in money, for cheese at 30s per cwt. what quantity of cheese must B receive?

Ans. 82 cwt.

LOSS AND GAIN.

By this rule we discover what is got or lost in buying or selling of goods, and how to raise or fall the price so as to gain or lose so much per cent.

R U L E.

1. Say as the whole quantity of goods is to the sum of the cost and proposed gain, so is any part of the said goods to the price they must be sold for.

2. When the proposed gain or loss is at so much per cent. if gain, make 100% with the gain added to it, your second term; if loss, subtract the loss from 100% the remainder make your second term.

EXAMPLES. (Page 218.)

Ex. 1. Bought 4 cwt. of cheese at 30s. per cwt. which I sold out at $4\frac{1}{2}d$ per pound, what is my whole profit?

C.	s.	C.	lb.	d.	C.
1	: 30	:: 4	1	: $4\frac{1}{2}$:: 4
	4			4	4
<hr/>			<hr/>		
210	12	0	18		16
					28
<hr/>			<hr/>		
£. 6 what bought for			<hr/>		
			448		
			18		

4)8064

12)2016

210)1618

£. 8 8 what sold for
6 0 bought for

£. 2 8 gained thereby.

2. At what price must I sell raisins per cwt. which cost 30s per cwt. to gain 10 per cent? Ans. £.1 13

3. How must I sell coffee per cwt. that cost 33s to lose 10 per cent? Ans. £.1 9 8 $\frac{1}{2}$ $\frac{6}{8}$

4. Bought cloth at 6s 8d per yard, which not proving so good as I expected, I am resolved to lose 15 per cent. by it, how must I sell it per yard? Ans. 5s 8d

5. If I buy cloth at 6s 8d per yard, how must I sell it per yard to gain 15 per cent? Ans. 7s 8d

6. If I buy tobacco at 10l 10s per cwt. at what rate must I retail it at per pound to gain 10 per cent? Ans. 2s 0 $\frac{1}{2}$ d

7. Bought goods at 10l 10s per cwt. and sold them again retail at 2s 0 $\frac{1}{2}$ d per pound, what was the gain per cent? Ans. 10l. per cent.

8. If I buy cloth at 5s per yard, what shall I gain per cent. if I sell it for 6s 6d per yard? Ans. 30l.

9. At 2s 6d in the pound profit, what is gained per cent? Ans. £.12 10

SINGLE FELLOWSHIP.

By this rule any number may be divided into any assigned number of parts which shall be proportional to so many other proposed numbers.

R U L E.

Say by the Rule of Three, as the whole stock is to the whole gain or loss, so is each man's particular stock to his particular part of the gain or loss.

EXAMPLES. (Page 221.)

Ex. 1. Two persons, A and B, trade together, A put into stock 40l and B 60l they gain by trading 50l what is each persons share of the profit?

7. A gentleman unskilled in numbers, ordered 2280*l* to be divided amongst his four sons, thus; give A, says he, one-third, B one-fourth, C one-fifth, and D one-sixth; you are therefore required to part this equitably amongst them.

Ans. A 800*l*, B 600*l*, C 480*l*, D 400*l*.

8. Five parties of men, belonging to a man of war, of 45, 60, 64, 72, and 80 men in a party, plundered the enemy of 24075*l*. you are required to divide this money amongst them, so that each party shall have their proportional share.

Ans. first party's share 3375*l*, second 4500*l*, third 4800*l*, fourth 5400*l*, fifth 6000*l*.

DOUBLE FELLOWSHIP,

Is when equal or different stocks are employed for different times.

R U L E.

Multiply each man's stock by the time of its continuance, then say, as the sum of the products is to the whole gain or loss, so is each man's particular product to his share of the loss or gain.

EXAMPLES. (Page 231.)

Ex. 1. Two partners, A and B, enter into partnership, A put in 400*l*. for 3 months, and B 200*l*. for 4 months; they trade and gain 120*l*. how must it be divided between them?

£.	£.
40	20
3	4
—	—
120	80
80	
—	

$$200 : 10 :: 120$$

$$\begin{array}{r} 120 \\ 2100 \overline{) 12100} \end{array}$$

£.6 A's share.

$$200 : 10 :: 80$$

$$2100 \overline{) 8100}$$

4 B's share.

6 A's share.

£.10 Proof.

2. Three merchants, A, B, and C, engage in partnership, A put in 120*l* for 4 months, B 230*l* for 3 months, and C 360*l* for 2 months; they trade and gain 120*l*. required each person's share of the gain?

Ans. A's share is 30*l*. 9*s*. 6½*d*. $\frac{27}{189}$

B's ditto — 43 16 2½ $\frac{27}{189}$

C's ditto — 45 14 3½ $\frac{135}{189}$

3. Four butchers, A, B, C, and D, jointly hired a pasture of a neighbour for 14*l*. into which A turned six oxen for 12 days, B eight oxen for 14 days, C ten oxen for 16 days, and D twelve oxen for 20 days, how much must each butcher pay for his share of the pasture?

Ans. A's share 1*l*. 14*s*. 6*d*. $\frac{576}{384}$

B's ditto 2 13 8½ $\frac{312}{384}$

C's ditto 3 16 8½ $\frac{112}{384}$

D's ditto 5 15 0½ $\frac{168}{384}$

4. Four merchants trade after this manner, A puts in 100*l*. for 8 months, B puts in 80*l*. for 5 months, and then puts in 20*l*. more for 3 months longer, C puts in 176*l* for 4 months, and then takes out 40*l*. for 4 months more, D puts in 230*l*. for 6 months, and then takes out the whole; they gained 200*l*. what is each merchant's share thereof?

Ans. A's share 38*l*. 15*s*. 2½*d*. $\frac{1248}{4128}$

B's ditto 33 18 3½ $\frac{576}{4128}$

C's ditto 60 9 3½ $\frac{2112}{4128}$

D's ditto 66 17 2½ $\frac{192}{4128}$

5. Three merchants, A, B, and C, trade with a common stock of 2000*l*. A gains 200*l*. in 8 months; B 168*l*. in 12 months; and C 240*l*. in 6 months; what was each of their particular stocks?

Ans. A's stock 632*l*. 18*s*. 2½*d*. $\frac{72}{72}$

B's ditto 354 8 7½ $\frac{13}{72}$

C's ditto 1012 13 1½ $\frac{21}{72}$

ALLIGATION MEDIAL,

Teacheth how to find the mean rate of a mixture, when the particular quantities mixt, and their several rates are given.

R U L E.

Multiply each quantity of the mixture by its price; then the sum of the products divided by the sum of the quantities, gives the mean rate of the compound.

EXAMPLES. (Page 240.)

Ex. 1. Suppose 16 bushels of wheat at 6s a bushel, and 8 bushels of rye at 4s a bushel, were mixed together; how must the compound be sold per bushel without loss or gain?

$$\begin{array}{r}
 \text{Bush.} \quad s. \quad s. \\
 16 \times 6 = 96 \\
 8 \times 4 = 32 \\
 \hline
 24) \quad 128 \begin{array}{l} s. \quad d. \\ 5 \quad 4 \end{array} \text{ Anf.} \\
 \quad 120 \\
 \hline
 \quad \cdot \cdot 8 \\
 \quad 12 \\
 \hline
 24) 96 \begin{array}{l} s. \quad d. \\ 4 \end{array} \\
 \quad 96 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 s. \quad d. \\
 5 \quad 4 \\
 4 \times 6 = 24 \\
 \hline
 1 \quad 1 \quad 4 \\
 \quad 6 \\
 \hline
 \pounds. 6 \quad 8 \quad 0 = 128d. \text{ proof}
 \end{array}$$

2. A Tea-dealer mixed 2 pounds of tea at 4s a pound, with 2 pounds at 5s per pound, and 3 pounds at 8s per pound, how must the mixture be sold per pound? Anf. 6s

3. With 36 gallons of canary at 6s 6d per gallon, I mixed 12 gallons of white wine, at 5s per gallon, and to these added 12 gallons of cyder at 3s per gallon, at what rate must I sell this mixture per gallon? Anf. 5s 6d

4. A goldsmith melts 3 pounds of gold of 18 carats fine, 1 pound of 20 carats fine, 1 pound of 22 carats fine, and 3 pounds of 24 carats fine, how many carats fine is this mixture?

Anf. 21 carats fine

5. A maltster mixes 12 bushels of malt at 6s a bushel, 6 bushels at 5s, 6 at 4s 6d, 18 at 3s 6d, and 24 at 3s, at what rate may he sell this mixture at per bushel?

Anf. 4s

6. Having mixed together 4 gallons of ale at 16d per gallon, 4 at 12d, 3 at 9d, 1 at 5d, and 12 at 4d, how much per gallon is the mixture worth?

Anf. 8d

ALLIGATION ALTERNATE.

Is the method of finding what quantity of any number of simples, whose rates are given, will compose a mixture of a given rate.

R U L E.

1. Write the rates of the simples in a column under each other.

2. Link with a continued line the rate of each simple which is less than that of the compound with one or any number of those which are greater, and each greater rate with one or any number of the less.

3. Write the difference between the mixture rate, and that of each of the simples, opposite the rates with which they are linked.

4. If only one difference stand against any rate it will be the quantity belonging to that rate; but if there be several, their sums will be the quantity.

EXAMPLES. (Page 241.)

Ex. 1. A man would mix wheat at 6s per bushel, with rye at 4s per bushel, to sell it at 5s 4d per bushel; how much of each must he take?

d.

$$\begin{array}{rcl}
 \text{d. bush.} & & 72 \times 16 = 1152 \\
 64 \left\{ \begin{array}{l} 72 \\ 48 \end{array} \right\} \begin{array}{l} 16 \text{ wheat} \\ 8 \text{ rye} \end{array} \left. \vphantom{\begin{array}{l} 72 \\ 48 \end{array}} \right\} \text{Ans.} & & 48 \times 8 = 384 \\
 & & \hline
 & & 24) 1536 (64 \text{ proof} \\
 & & \quad 144 \\
 & & \hline
 & & \cdot \cdot 96 \\
 & & \quad 96 \\
 & & \hline
 & & -
 \end{array}$$

2. How much tea at 4s at 5s and at 8s per pound must be mixed together that the compound may be worth 6s per pound? *Ans.* 2lb. at 4s. 2 at 5s. and 3 at 8s

3. How much wine at 6s 6d at 5s and at 3s per gallon must be mixed together that the composition may be worth 5s 6d per gallon? *Ans.* 36 gal. at 6s 6d 12 at 5s and 12 at 3s

4. A goldsmith hath gold of 18, 20, 22, and 24 carats fine, how much must he take of each sort to make it 21 carats fine? *Ans.* 3 at 18, 1 at 20, 1 at 22, 3 at 24

5. A maltster hath malt at 6s. 5s. 4s 6d. 3s 6d. and 3s. per bushel, how much of each sort must he take to sell it at 4s per bushel? *Ans.* 12 at 6s. 6 at 5s. 6 at 4s. 6d. 18 at 3s. 6d. 24 at 3s

6. A victualler hath ale at 16d, at 12d, at 9d, at 5d, and at 4d per gallon, how many gallons of each sort must he take to sell it at 8d per gallon? *Ans.* 4 at 16d. 4 at 12d. 3 at 9d. 1 at 5d. 12 at 4d

ALLEGATION PARTIAL.

This rule is so called because a part of the mixed ingredients only are given.

R U L E.

Take the difference between each price and the mean rate, then say, as the difference opposite to the known quantity is to the given quantity, so is any other difference to its respective quantity sought.

EXAMPLES.

EXAMPLES. (Page 243.)

Ex. 1. A farmer would mix 8 bushels of wheat at 6s per bushel, with rye at 4s per bushel, how much rye must he take that the mixture may be worth 5s 4d per bushel?

$$\begin{array}{rcl} & d. & d. \quad bu. \\ \text{mean } 64 & \left\{ \begin{array}{l} 72 \\ 48 \end{array} \right\} & \begin{array}{l} 16 \text{ wheat} \\ 8 \text{ rye} \end{array} \end{array}$$

As 16 : 8 :: 8 : 4 bushels, Ans.

2. To 6 pounds of tea at 8s per pound, a grocer mixed inferior teas at 5s and 4s per pound, how much of the two last sorts must he take to mix with the given quantity, to sell the composition at 6s per pound?

Ans. 4lb of each of the other sorts

3. How much wine at 3s and 5s per gallon must be mixed with 18 gallons of canary at 6s 6d per gallon, so that the mixture may be worth 5s 6d per gallon?

Ans. 6 gallons of the other two sorts

4. How much gold of 20, 22, and of 24 carats fine, must be mixed with 6 pounds of 18 carats fine, so that the composition may be 21 carats fine?

Ans. 2lb. of 20 and 22, and 6lb 24 carats fine

5. How much malt at 5s. 4s. 6d. 3s. 6d. and 3s. per bushel, must be mixed with 6 bushels at 6s per bushel, that the mixture may be sold for 4s. per bushel?

Ans. 12 at 5s. 12 at 4s. 6d. 36 at 3s. 6d. 48 at 3s.

6. How much ale at 4d. at 5d. at 9d. and at 12d. a gallon must be mixed with 8 gallons at 16d per gallon, that the mixture may be worth 8d a gallon?

Ans. 8 gallons at 12d. 6 at 9d. 2 at 5d. 24 at 4d.

ALLIGATION

ALLIGATION TOTAL.

Is when the total sum of the quantities to be mixed, price of each, and mean price given, and the particular quantity of each ingredient is required.

R U L E.

As the sum of all the differences is to the whole quantity of the mixture, so is each particular difference to its particular quantity.

EXAMPLES (Page 245.)

Ex. 1. How many gallons of water must be mixed with wine worth 4s per gallon, so as to fill a vessel of 16 gallons, that a gallon may be sold for 3s?

$$\begin{array}{rcl}
 3 \left\{ \begin{array}{l} 4 \\ 0 \end{array} \right\} 3 & \begin{array}{c} g. \quad g. \\ 4 : 16 \end{array} :: & \begin{array}{c} \left\{ \begin{array}{l} g. \quad g. \\ 3 : 12 \text{ wine} \\ 1 : 4 \text{ water} \end{array} \right. \\ \hline \text{sum } 4 & & \text{proof } 16 \text{ gallons}
 \end{array}$$

Or, As $\begin{array}{c} g. \quad s. \\ 16 : 48 \end{array} :: \begin{array}{c} g. \quad s. \\ 1 : 3 \end{array}$ mean price, given proof

2. A grocer hath sugar at 3d, 4d, 6d and 10d a pound, and he would make a mixture of 112 pounds, so that it might be afforded at 6d per pound, how much of each sort must he take?

Ans. 26 $\frac{6}{7}$ lb at 3d, 26 $\frac{6}{7}$ at 4d, 26 $\frac{6}{7}$ at 6d, 32 $\frac{16}{17}$ at 10d

3. A goldsmith would mix gold of 22, of 20, of 18, of 17, and 14 carats fine, how much of each sort must be melted together to form a composition of 200 ounces of 19 carats fine?

Ans. 76 $\frac{1}{3}$ oz. of 22, 46 $\frac{2}{3}$ of 20, 15 $\frac{5}{13}$ of 18, 15 $\frac{5}{13}$ of 17, 46 $\frac{2}{13}$ of 14

4. A farmer would mix wheat at 8s with rye at 6s, barley at 4s, and oats at 2s per bushel, to be sold at 4s 8d per bushel, how much of each sort must he take to have a quantity of 240 bushels?

Ans. 80 of wheat, 20 rye, 40 barley 100 oats

5. A goldsmith would mix gold of 24, of 21, and of 19 carats fine, with a quantity of alloy, so that 190 ounces might bear 16 carats fine, how much of each sort must he take?

Anf. $47\frac{1}{2}$ oz. of each sort

EXCHANGE,

Consists in finding what sum of money of one county will be equal to any given sum of another, according to a certain given course of exchange.

ENGLAND WITH FRANCE.

Accounts are kept in France in livres, sols, and deniers, and they exchange by the crown tournois.

12 deniers	} make one	{	sol
20 sols			livre
3 livres			ecu, or crown tournois.
10 livres			pistole
24 livres			lous d'or, or guinea

Exchange from 30d to 50d sterling per ecu.

EXAMPLES. (Page 247.)

Ex. 1. What sterling money must be paid in London to receive in Paris 1000 crowns, exchange 30d per crown, or ecu?

cr.	d.	cr.
1	: 30	:: 1000
		30
		<hr/>
		17)30000
		<hr/>
		20)25000
		<hr/>
		£. 125 Anf.

2. What number of crowns must be paid in Paris to receive in London 125/ exchange 30 pence per crown?

Anf. 1000 crowns

3. In 280 livers, 13 sols, 4 deniers, how much sterling, exchange at 31d per ecu? Ans. 12l 15s 8d $\frac{2}{3}$

4. In 12l 15s 8d $\frac{2}{3}$ sterling how much French money exchange at 31d sterling per ecu? Ans. 280f. 13 sol. 4 den.

5. What sterling money is equal in value to 2148 French crowns, 2 livres, 4 sols, 6 deniers, exchange at 4s 2d per crown? Ans. 447l 13s 1d $\frac{1}{2}$

6. A gentleman on his travels received in France 2148 crowns, 2 livres, 4 sols, 6 deniers, for a bill of exchange whose value in England was 447l 13s 1d $\frac{1}{2}$ sterling; what was the exact course of exchange? Ans. 4s 2d

S P A I N.

Accounts are kept in Spain in piaftres, rials and marvadies and they exchange by the piaftre or pifo.

4 Marvidies vellon, or	} make one	{	Quarta
2 $\frac{1}{8}$ marvadies of plate			
8 $\frac{1}{2}$ Quartas, or 34 mar-		{	Rial vellon
vadies vellon			
16 Quartas, or 34 mar-		{	Rial of plate
vidies of plate			
8 Rials of plate	}	{	Pifo, piaftre, piece of 8 or
5 Piaftres			Spanish piftole [dol.
2 Piftole			Doubloon

Exchange from 38d to 50d sterling per pifo.

EXAMPLES. (Page 249.)

1. In 1440l how many piaftres, exchange at 50d per piaftre or pifo?

$$\begin{array}{rcl}
 d. & P. & £. \\
 50 & : 1 & :: 1440 \\
 & & 20 \\
 \hline
 & & 28800 \\
 & & 12 \\
 \hline
 \end{array}$$

$$5 \overline{) 0345600}$$

Ans. 6912 piaftres

• L

2.

2. Suppose Spain draws upon London for 6912 piaſtres, what ſterling money will the draft amount to, when the exchange is at 50d ſterling per piſo? Anf. 1440l

3. How much sterling money must be received at London, for a bill remitted from Cadiz, of 2600 piaſtres, 6 rials, and 20 marvidies; exchange at 48*d* per piaſtre?

4. How many piastres must be received at Cadiz, for 50*l* 3*s* 3*d* $\frac{16}{8}$ sterling, exchange at 48*d* per piastre?

5. A merchant received in Madrid 2600 piastres, 6 rials, and 20 marvidies for a bill of exchange, whose sterling value in London, was $520\text{ }3\text{ }3\frac{16}{8}$ what was the course of exchange? Ans. 48

P O R T U G A L.

Accounts are kept in Portugal in reas and milreas, and the exchange is by the milrea.

400 Reas make one Cruzado.

1000 Reas, or $2\frac{1}{2}$ crusadoes - - - Milrea.

Exchange from 60*d* to 67*d* per milrea.

EXAMPLES. (Page 252.)

1. How many milreas will 3656/- amount to; exchange at 60d per milrea?

$$\begin{array}{r} s. \quad mil. \quad \pounds. \\ 5 : 1 :: 36,6 \\ \quad \quad \quad 20 \end{array}$$

$$5 : 1 :: 36,6$$

20

5)73120

Anf. 14624 mil.

2. In 14624 milreas, how many pounds sterling; exchange at 60d sterling per milrea? Ans. 3656l

3. Suppose a bill of 360*l* 4*s* 8*d* Sterling was drawn at Birmingham to be paid in Lisbon; how many milreas &c. will this bill amount to, exchange at 64*d* per milrea?

Exchange.

III

4. How much sterling money will 1350 milreas 875 reas, amount to; exchange at 64d per milrea?

Ans. 360l 4s 8d

HOLLAND FLANDERS, and GERMANY.

Accounts are kept in these places, in guilders, stivers, and pennings; or in pounds, shillings, and pence, as in England.

The money of Holland and Flanders is distinguished by the name of Flemish, and they exchange by the pound sterling.

8 pennings
2 grotes
6 stivers
20 stivers
2½ florins
6 florins

} make one {
grote or penny
stiver
schilling
florin or guilder
rix-dollar
pound flemish

Exchange from 33s 6d to 36s 6d flemish per pound sterling.

Agio from 3 to 6 per cent. for current.

To turn current money into banco.

R U L E.

As 100 with the agio added to it, is to 100, so is any given sum current to its value banco.

EXAMPLES. (Page 253.)

Ex. 1. How much bank money can I have for 2982 guilders current money, the agio being 5 guilders per cent?

$$\begin{array}{r}
 \text{gil.} \quad \text{gil.} \quad \text{gil.} \\
 105 : 100 :: 2982 \\
 \quad \quad \quad 100 \\
 \hline
 \quad \quad \quad \text{guil.} \\
 105 \overline{) 298200} (2840 \text{ Anf.} \\
 \underline{210} \\
 \quad 882 \\
 \quad \underline{840} \\
 \quad \quad 420 \\
 \quad \quad \underline{420} \\
 \quad \quad \quad 0
 \end{array}$$

2. How much bank money, the agio being 4 per cent. can I have for 110 guilders 12 stivers?

Anf. 106 *guil.* 6 *stiv.* 1 *gr.* $6\frac{1}{3}$ *pen.*

To turn banco money into current.

R U L E.

As 100, is to 100 with the agio added to it, so is any given sum to its value current.

3. Change 2840 guilders banco, into current money; agio 5 per cent. Anf. 2982

4. Change 106 guilders, 6 stivers, 1 grote, $6\frac{1}{3}$ pennings banco, into current money, agio 4 per cent?

Anf. 110 *guil.* 12 *stiv.*

To reduce Flemish pounds, shillings, and pence into guilders.

R U L E.

Divide the whole sum, when reduced into pence flemish by 40 (the number of pence in one guilder) the quotient will

will be guilders; the remainder (if any) divide by 2, the pence in one stiver, and the quotient will be stivers.

5. In 640/ flemish, how many guilders? Ans. 3840.
6. In 3840 guilders, how many flemish pounds? Ans. 640/
7. In 864/ 12s flemish; how many guilders? Ans. 5187 *guil.* 12 *stiv.*
8. In 5187 guilders, 12 stivers, how many flemish pounds? Ans. 864/ 12s

To reduce sterling into flemish money.

R U L E.

As 1 pound sterling is to the given rate of exchange, so is the given sterling to the flemish sought.

9. To how much flemish will 350/ sterling amount, exchange at 34s per pound sterling? Ans. 595/
10. How much flemish must be given for 842/ 5s sterling, exchange at 33s 6d flemish per pound sterling? Ans. 1410/ 15s 4¹/₂d

To reduce flemish money into sterling.

R U L E.

As the given rate of exchange, is to one pound sterling, so is the given flemish to the sterling required.

11. To how much sterling will 595/ flemish amount, exchange at 34s per pound sterling? Ans. 350
12. How much sterling must be given for 1410/ 15s 4¹/₂d flemish; exchange at 33s 6d per pound sterling? Ans. 842/ 5s
13. In 5187 florins, 12 stivers banco, how many pounds sterling exchange at 34s per pound flemish? Ans. 508/ 11s 9d ³/₄
14. A merchant received in Amsterdam 5187 florins, 12 stivers banco for a bill whose sterling value was 508/ 11s 9³/₄d what was the course of exchange per pound flemish? Ans. 34s

HAMBRO.

H A M B R O.

Accounts are kept at this place in marks and fol lubs, and exchange by the pound sterling as in Holland.

2 deniers	} make one {	fol lub
6 fol lubs		fol gros
16 fol lubs		mark
2 marks		drittle, or Hambro dollar
3 marks		rix-dollar
7½ marks		livre gros, or pound flemish

Exchange from 32s to 35s flemish, per pound sterling, agio from 18 to 20 per cent. for current, and from 30 to 35 per cent. for flight.

EXAMPLES. (Page 257.)

Ex. 1. In 624 marks bank money of Hambro, how many pounds sterling, exchange at 32 fols gros per pound sterling?

<i>l. gr.</i>	<i>l.</i>	<i>marks.</i>
32	:	1 :: 624
6		16
<hr/>		
192		9984
2		2
<hr/>		
384)	19968 (52 Anf.
		1920
		<hr/>
		768
		768
		<hr/>

2. In 52l sterling, how many Hambro marks, exchange at 32 fols gros per pound sterling? Anf. 624 marks

3. In 1724 marks 5 fol. l. banco, how many pounds sterling, exchange 36 fol. g. 1 den. per pound sterling?

Anf. 127l 8s 7½d $\frac{2}{3}$

4. In 127/8s 7½d ²⁵⁸/₄₃₃ sterling, how many Hambro marks, exchange at 36 sol. gros. 1 den. per pound sterling?

Ans. 1724 marks 5 sol. l.

VENICE.

They keep their accounts at Leghorn in dollars, soldi, and denari, and exchange by the ducat and piastre.

12 denari

20 soldi

5 ¹/₈ soldi

24 grosso

{ make one }

foldi

lira, or piastre of Leghorn

grosso

ducat

Exchange from 52d. to 54d. per ducat, and from 45d. to 54d. per piastre; agio 20 per cent.

EXAMPLES. (Page 260.)

Ex. 1. In 460l. sterling, how many piastrs of Leghorn, exchange at 50d. per piastre?

$$\begin{array}{rcl} d. & pia. & £. \\ 50 & : 1 & :: 460 \\ & & 20 \end{array}$$

9200

12

510)1104010

Ans. 2208 Piastrs.

2. In 2208 piastrs, bank money of Leghorn, how many pounds sterling, exchange at 50d. sterling per piastre?

Ans. 460l.

3. Reduce 2918 piastrs 10 sols, bank money of Venice, into sterling money, exchange at 48d. sterling per piastre.

Ans. 583l. 14s.

4.

4. In 583*l.* 14*s.* sterling, how many piaſtres &c. exchange at 48*d.* per piaſtre?

Ans. 2918*pia.* 10*ſol.*

5. Reduce 4780 piaſtres, 12 ſols, 6 den. bank money of Venice, into ſterling money, exchange at 53*d.* ſterling per piaſtre.

Ans. £.1055 14 5 $\frac{1}{8}$

6. In 1055*l.* 14*s.* 5 $\frac{1}{8}$ *d.* ſterling, how many piaſtres, exchange at 53*d.* per piaſtre?

Ans. 4780*pia.* 12*ſol.* 6*de.*

R U S S I A.

They keep their accounts at Petersburgh in rubles and copecs, and exchange by the ruble.

3 copecs
10 copecs
25 copecs
2 polpolitins
2 politins
2 rubles

} make one {

altine
grivena
polpolitin
politin
ruble
ducat

Russia exchanges with London by way of Hambro, or Amsterdam, at the rate of 48 to 50 ſtivers per ruble; and ſometimes directly to London from 4*s.* to 5*s.* per ruble.

EXAMPLES. (Page 262.)

Ex. 1. In 614*l.* 11*s.* 8*d.* ſterling, how many rubles, exchange at 4*s.* 2*d.* ſterling per ruble?

$$\begin{array}{rcl}
 \text{s. d. rub.} & \text{£. s. d.} & \\
 4 \ 2 : 1 :: 614 \ 11 \ 8 & & \\
 12 & 20 & \\
 \hline
 50 & 12291 & \\
 & 12 & \\
 \hline
 & 5101475010 &
 \end{array}$$

Ans. 2950 Rubles.

2. In 2950 rubles how many pounds ſterling, exchange 4*s.* 2*d.* per ruble?

Ans. £.614 11 8

3. In 940*l.* 12*s.* 6*d.* sterling, how many rubles, &c. exchange at 4*s.* 6*d.* sterling per ruble? Ans. 4180*ru.* 55½*cop.*

4. In 4180 rubles 55½ copecs how many pounds sterling, exchange at 4*s.* 6*d.* per ruble? Ans. £ 940 12 6

POLAND AND PRUSSIA.

Accounts are kept at Dantzic in florins, gros, and penins, and exchange by the gros.

18 penins
18 gros
30 gros
3 florins
2 rix dollars

} make one

{ gros
oort
florin, or Polish guilder
rix dollar
gold ducat

Exchange is made with Poland and Prussia by way of Holland, the exchange being from 240 to 295 groffi per pound flemish.

EXAMPLES. (Page 263.)

Ex. 1. In 780*l.* sterling, how many Prussian florins, exchange 270 groffi per pound flemish, and 33*s.* 4*d.* flemish per pound sterling?

$$\begin{array}{rcl} \text{£.} & \text{s. d.} & \text{£.} \\ 1 & : 33 \ 4 & :: 780 \\ & 12 & 400 \\ \hline & 400 & 12)312000 \\ & & \hline & & 210)260010 \\ & & \hline & & \text{£. 1300 flem.} \end{array}$$

$$\begin{array}{rcl} \text{£.} & \text{groffi} & \text{£.} \\ 1 & : 270 & :: 1300 \\ & & 270 \\ \hline & & 91000 \\ & & 2600 \\ \hline & & 310)3510010 \end{array}$$

Ans. 11700 florins.

2. In 11700 Prussian florins, how many pounds sterling, exchange 270 groffi per pound flemish, and 33*s.* 4*d.* flemish per pound sterling?

Ans. £. 780

3. In 875*l*. 12*s* 6*d* sterling, how many rix-dollars, &c. exchange 290 groffi Polish per pound Flemish, and 34*s* 4*d* Flemish per pound sterling? Ans. 4843*r.d.* 458*gr.* 5*½**pe.*

4. In 4843 rix-dollars, 45 groffi, 5*½* penins Polish, how many pounds sterling, exchange 290 Polish groffi per pound Flemish, and 34*s* 4*d* Flemish per pound sterling?

Ans. £.1503 3 1*½* Flem. and £.875 12 6 sterl.

S W E D E N.

They keep their accounts at Stockholm, in copper dollars, and orts, or in silver dollars, and exchange by the copper dollar.

8 penins	}	make one	{	runstychen
3 runstychens				silver or whitton
8 flivers				marc
10 flivers and 2 runstych.				copper dollar
or 32 runstichens				
3 copper dol. and 32 sti.	}	}	{	silver dollar
or 96 runsty. or 4 mar.				
24 marcs	}	}	{	copper rix-dollar

Exchange from 46 to 50 copper dollars per pound sterling.

EXAMPLES. (Page 267.)

Ex. 1. In 246*l.* sterling, how many copper dollars, exchange 46 copper dollars per pound sterling?

$$\begin{array}{rcl}
 \text{£.} & \text{c.d.} & \text{£.} \\
 1 & : 46 & :: 246 \\
 & & 46 \\
 \hline
 & & 1476 \\
 & & 984 \\
 \hline
 \end{array}$$

Ans. 11316 Copper dollars.

2. In 11316 copper dollars, how many pounds sterling, exchange 46 copper dollars per pound sterling? Ans. £.246

3. In 293*l.* 15*s.* sterling how many copper dollars, exchange 48 copper dollars per pound sterling?

Ans. 14100 cop. dol.

4. In 14100 copper dollars how many pounds sterling, exchange 48 copper dollars per pound sterling? Ans. £.293 15

5. In 5838 silver dollars, 9 runstychens, how many pounds sterling, exchange 49 copper dollars per pound sterling?

Ans. £.357 8 8 $\frac{23}{98}$

6. In 357*l.* 8*s.* 8*d.* $\frac{23}{98}$ sterling, how many silver dollars, &c. exchange 49 copper dollars per pound sterling?

Ans. 5838*s.d.* 9*ru.*

IRELAND, AMERICA, and the WEST-INDIES.

Accounts are kept in these places, in pounds, shillings, and pence, as in England.

The course of exchange between England and Ireland is from 5 to 12 per cent. also 5*l.* sterling is accounted worth 7*l.* of the currency of the West-Indies, on account of the scarcity of cash.

EXAMPLES. (Page 270.)

Ex. 1. What money must be received in Dublin for 750*l.* sterling, remitted from London, exchange at 6 per cent?

$$\begin{array}{rcl} \text{£.} & \text{£.} & \text{£.} \\ 100 & : 106 & :: 750 \\ & & 106 \end{array}$$

4500

7500

1100)79500

£.795 Ans.

2. Ireland remits to London 795*l.* Irish, how much sterling must Ireland be credited with, exchange 6 per cent?

Ans. £.750

3. London remits to Dublin, 751*l.* 10*s.* what must be received there, exchange 10 per cent? Ans. £.826 13
4. Dublin remits to London 826*l.* 13*s.* what must be received there, exchange at 10 per cent? Ans. £.751 10
5. London remits to Jamaica for 726*l.* sterling, what must be received for it, exchange at 50 per cent? Ans. £.1089
6. Jamaica remits to London for 1089*l.* currency, what must be received for it, exchange at 50 per cent? Ans. £.726
7. Philadelphia is indebted to London 1089*l.* 10*s.* currency, what sterling may London reckon to be remitted when the exchange is 60 per cent? Ans. £.680 18 9
8. London receives a bill of exchange from Philadelphia, for 680*l.* 18*s.* 9*d.* sterling, for how much currency was London indebted, exchange being at 60 per cent? Ans. £.1089 10

ARBITRATION OF EXCHANGES,

Is the method of finding such a rate of exchange between any two places as shall be in proportion with the rates assigned between each of them, and a third place.

EXAMPLES. (Page 272.)

Ex. 1. If the exchange between London and Amsterdam be 33*s.* 4*d.* per pound sterling, and the exchange between London and Paris be 33*d.* per crown, required the par of arbitration between Amsterdam and Paris?

£.	s.	d.	d.
1	:	33 4	:: 33
20		12	
20		400	
12		33	
240		1200	
		1200	
$2410 \left\{ \begin{array}{l} 4) 132010 \\ \hline 6) 330 \end{array} \right.$			

Ans. 55*d.* Flem. per cr. }

2. If the exchange between Amsterdam and Paris be 55*d* per crown, and between Amsterdam and London 33*s* 4*d* per pound sterling, required the arbitrated price between Paris and London? *Ans.* 33*d*.

3. London changes with Amsterdam, on par at 33*s* 4*d* Flemish per pound sterling; Amsterdam changes on Middleburgh at 3 per cent. advance, how stands the exchange between London and Middleburgh? *Ans.* £. 1 14 4

4. If the exchange between Middleburgh and London be 1*l* 14*s* 4*d* per pound sterling, and between Middleburgh and Amsterdam 33*s* 4*d* and 3 cent. how stands the exchange between Amsterdam and London? *Ans.* 33*s*. 4*d*.

VULGAR FRACTIONS,

Are expressions for any assignable part or parts of an unit, and are represented by two numbers placed one above another, with a line drawn between them, thus $\frac{2}{3}$. The figure above the line is called the numerator, and that below the denominator.

The denominator shews how many parts the integer is divided into, and the numerator shews how many of those parts are meant by the fraction.

A proper fraction is when the numerator is less than the denominator, as $\frac{2}{3}$, $\frac{3}{4}$, &c.

An improper fraction is when the numerator exceeds the denominator, as $\frac{3}{2}$, $\frac{8}{4}$, &c.

A single fraction is an expression for any number of parts of the integer.

A compound fraction is a fraction of a fraction consisting of two or more simple fractions, as $\frac{1}{2}$ of $\frac{2}{3}$, of $\frac{3}{4}$, &c.

A mixed number is composed of a whole number, and a fraction, as $8\frac{1}{2}$, $12\frac{3}{4}$, $13\frac{5}{8}$, &c.

REDUCTION OF VULGAR FRACTIONS.

CASE I.

To reduce a fraction to another of equal value.

R U L E.

Multiply or divide both terms of the fraction by the same number, and you will have the fraction required.

EXAMPLES. (Page 273.)

Ex. 1. Reduce $\frac{4}{5}$ to another of equal value.

$$\begin{array}{r} 4 \qquad 6 \\ 5 \qquad 5 \\ \hline 20 \qquad 30 \end{array} \text{ Anf. } \frac{20}{30}.$$

2. Reduce $\frac{20}{30}$ to another fraction of equal value. Anf. $\frac{4}{6}$.
 3. Reduce $\frac{8}{12}$ to another fraction of equal value. Anf. $\frac{2}{3}$.
 4. Reduce $\frac{24}{36}$ to another fraction of equal value. Anf. $\frac{2}{3}$.

CASE II.

To reduce a whole number to the form of a fraction.

R U L E.

Place one under it for a denominator.

EXAMPLES. (Page 273.)

Ex. 5. Let it be required to reduce 4 to the form of a fraction.

$$\begin{array}{r} 4 \\ \hline 1 \end{array} \text{ Anf. } \frac{4}{1}$$

6. Let it be required to reduce 6 to the form of a fraction. Anf. $\frac{6}{1}$.

7. Suppose 8 to be the whole, required the fraction ?
 Ans. $\frac{8}{1}$.
 8. Suppose 12 to be the whole, required the fraction ?
 Ans. $\frac{12}{1}$.

C A S E III.

To reduce a whole number to a fraction of a given denominator.

R U L E.

Multiply the whole number by the given denominator, and under the product write the same denominator.

EXAMPLES. (Page 273.)

9. Reduce 8 into a fraction, whose denominator shall be 4.

$$\begin{array}{r} 8 \\ 4 \text{ then } \frac{32}{4} \text{ is the Ans.} \\ \hline 32 \\ 4 \overline{)32} \\ \underline{32} \\ 0 \end{array}$$

$\frac{32}{4} = 8$ Proof.

10. Let it be required to reduce 6 into a fraction, whose denominator shall be 5.

Ans. $\frac{30}{5}$.

11. Required to reduce 9 into a fraction, whose denominator shall be 6.

Ans. $\frac{54}{6}$.

12. Let it be required to reduce 12 into a fraction, whose denominator shall be 10.

Ans. $\frac{120}{10}$.

C A S E IV.

To reduce a compound fraction to a single one.

R U L E.

Multiply all the numerators together for a new numerator, and all the denominators together for a new denominator.

* M 2

EXAM-

EXAMPLES. (Page 274.)

13. Reduce
- $\frac{1}{2}$
- of
- $\frac{2}{3}$
- of
- $\frac{3}{4}$
- to a single fraction.

$$\begin{array}{r} 1 \\ 2 \\ \hline 2 \\ 3 \\ \hline 3 \\ 4 \\ \hline \end{array}$$

Ans. $\frac{6}{24}$ the single fraction.
6 N. 24 D.

14. Reduce
- $\frac{2}{3}$
- of
- $\frac{3}{4}$
- of
- $\frac{5}{6}$
- to a single fraction. Ans.
- $\frac{10}{72}$
- .

15. Reduce
- $\frac{3}{4}$
- of
- $\frac{4}{5}$
- of
- $\frac{5}{6}$
- to a single fraction. Ans.
- $\frac{60}{120}$
- .

16. Reduce
- $\frac{4}{5}$
- of
- $\frac{5}{6}$
- of
- $\frac{6}{7}$
- to a single fraction. Ans.
- $\frac{160}{270}$
- .

C A S E V.

To reduce a mixed number to an improper fraction.

R U L E.

Multiply the whole number by the denominator of the fraction, and to the product add the numerator for a new numerator, which place over the denominator.

EXAMPLES. (Page 274.)

17. Reduce
- $5\frac{1}{2}$
- to an improper fraction.

$$\begin{array}{r} 5\frac{1}{2} \\ 2 \\ \hline \end{array}$$

Ans. $\frac{11}{2}$ the required fraction.

11

18. Reduce
- $6\frac{2}{3}$
- to an improper fraction. Ans.
- $\frac{20}{3}$
- .

19. Reduce
- $12\frac{5}{6}$
- to an improper fraction. Ans.
- $\frac{76}{6}$
- .

20. Reduce
- $25\frac{3}{8}$
- to an improper fraction. Ans.
- $\frac{203}{8}$
- .

C A S E VI.

To reduce an improper fraction to its equivalent whole or mixed number.

RULE.

R U L E.

Divide the numerator by the denominator, the quotient is the whole number, what remains place over the denominator, and annex this fraction to the quotient before found.

EXAMPLES. (Page 275.)

21. Reduce $1\frac{1}{2}$ to its equivalent whole or mixed number.

$$\begin{array}{r} 2 \overline{) 11} \\ \underline{} \end{array}$$

$5\frac{1}{2}$ Anf.

22. Reduce $\frac{20}{3}$ to its equivalent whole or mixed number:

Anf. $6\frac{2}{3}$.

23. Reduce $\frac{76}{6}$ to its equivalent whole or mixed number.

Anf. $12\frac{4}{3}$.

24. Reduce $\frac{203}{8}$ to its equivalent whole or mixed number.

Anf. $25\frac{3}{8}$.

C A S E VII.

To find the greatest common measure or divisor for the numerator and denominator of any given fraction, or for any two numbers.

R U L E.

Divide the greater term by the lesser, and the last divisor by the remainder, continually till nothing remains, the last divisor is the greatest common measure required.

* M 3

EXAMPLES.

EXAMPLES. (Page 275.)

25. What is the greatest common measure of
- $\frac{72}{120}$
- ?

$$\begin{array}{r}
 72 \overline{)120}(1 \\
 \underline{72} \\
 48 \overline{)72}(1 \\
 \underline{48} \\
 24 \overline{)48}(2 \\
 \underline{48}
 \end{array}$$

Ans. 24 the greatest common measure.

26. What is the greatest common measure of
- $\frac{126}{182}$
- ?

Ans. 14.

27. What is the greatest common measure of
- $\frac{2146}{3642}$
- ?

Ans. 2.

28. What is the greatest common measure of
- $\frac{363}{4898}$
- ?

Ans. 1.

C A S E VIII.

To reduce fractions to their lowest terms.

R U L E.

Divide both terms of the fraction by their greatest common measure, the quotient will be the terms of the fraction required.

EXAMPLES.

EXAMPLES. (Page 277.)

29. Reduce $\frac{1073}{1821}$ to its lowest terms?

$$\begin{array}{r} 1073)1821(1 \\ \underline{1073} \end{array}$$

$$748)1073(1 \quad \text{then } 1)\frac{1073}{1821}(=\frac{1073}{1821} \text{ Anf.}$$

$$\begin{array}{r} 325)748(2 \\ \underline{650} \end{array}$$

$$\begin{array}{r} 98)325(3 \\ \underline{294} \end{array}$$

$$\begin{array}{r} 31)98(3 \\ \underline{93} \end{array}$$

$$\begin{array}{r} 5)31(6 \\ \underline{30} \end{array}$$

$$\begin{array}{r} 1)5(5 \\ \underline{5} \end{array}$$

30. Reduce $\frac{1415}{6424}$ to its lowest terms.

Anf. $\frac{177}{803}$.

31. Reduce $\frac{3642}{4316}$ to its lowest terms.

Anf. $\frac{1821}{2158}$.

32. Reduce $\frac{340}{2138}$ to its lowest terms.

Anf. $\frac{85}{534}$.

33. Reduce $\frac{816}{4416}$ to its lowest terms.

Anf. $\frac{116}{741}$.

34. Reduce $\frac{2688}{3072}$ to its lowest terms.

Anf. $\frac{7}{8}$.

C A S E IX.

To reduce fractions of different denominators to those of equal value, having a common denominator.

R U L E.

Multiply each numerator by all the denominators except its own for a new numerator, and all the denominators together for a new denominator.

EXAMPLES.

EXAMPLES. (Page 279.)

35. Reduce
- $\frac{2}{3}$
- ,
- $\frac{3}{4}$
- to a common denominator.

$$\begin{array}{r} 2 \quad 3 \quad 3 \\ 4 \quad 3 \quad 4 \\ \hline \end{array}$$

8N. 9N. 12D. Anf. $\frac{8}{12}$ and $\frac{9}{12}$ the frac. required.

36. Reduce
- $\frac{3}{4}$
- ,
- $\frac{4}{5}$
- , and
- $\frac{5}{6}$
- to a common denominator.

Anf. $\frac{90}{120}$, $\frac{96}{120}$, $\frac{100}{120}$.

37. Reduce
- $\frac{1}{2}$
- ,
- $\frac{2}{3}$
- ,
- $\frac{3}{4}$
- , and
- $\frac{6}{7}$
- to a common denominator?

Anf. $\frac{84}{168}$, $\frac{112}{168}$, $\frac{126}{168}$, $\frac{144}{168}$.

38. Reduce
- $\frac{1}{3}$
- ,
- $\frac{1}{4}$
- ,
- $\frac{1}{5}$
- and
- $\frac{1}{6}$
- to a common denominator.

Anf. $\frac{120}{360}$, $\frac{90}{360}$, $\frac{72}{360}$, $\frac{60}{360}$.

39. Reduce
- $\frac{5}{8}$
- ,
- $\frac{4}{9}$
- ,
- $\frac{5}{10}$
- and
- $\frac{6}{12}$
- to a common denominator.

Anf. $\frac{5400}{8640}$, $\frac{3840}{8640}$, $\frac{4320}{8640}$, $\frac{4320}{8640}$.

40. Reduce
- $\frac{1}{3}$
- ,
- $\frac{1}{4}$
- ,
- $\frac{1}{5}$
- ,
- $\frac{1}{6}$
- and
- $\frac{1}{7}$
- to a common denominator.

Anf. $\frac{840}{2520}$, $\frac{630}{2520}$, $\frac{504}{2520}$, $\frac{420}{2520}$, $\frac{360}{2520}$.

C A S E X.

To reduce money, weights, measures, &c. into fractions.

R U L E.

Reduce the given quantity to the lowest denomination mentioned, and make it the numerator; then reduce the whole of the integer, which the given numbers are parts of, and make it the denominator, and you have the fraction required.

EXAMPLES (Page 281.)

41. Reduce 3s 6d to the fraction of a pound sterling?

$$\begin{array}{r} s. \quad d. \qquad \qquad s. \\ 3 \quad 6 \qquad \qquad 20 \\ 12 \qquad \qquad 12 \\ \hline 42 \qquad \qquad 240 \end{array}$$

Anf. $\frac{42}{240}$ the fraction required.

42. Reduce $6\frac{1}{2}d$ to the fraction of a shilling. *Ans.* $\frac{13}{24}$.
43. Reduce 3 roods, 12 poles to the Fraction of an acre. *Ans.* $\frac{132}{160}$.
44. Reduce 2 qrs. 12lb. to the fraction of a cwt. *Ans.* $\frac{68}{112}$.
45. Reduce $8\frac{1}{2}$ inches to the fraction of a foot. *Ans.* $\frac{17}{24}$.
46. Reduce $12\frac{1}{2}$ cwt. to the fraction of a ton? *Ans.* $\frac{25}{48}$.
47. Reduce 6 oz. 12 dwts. 16 grs. to the fraction of a pound troy? *Ans.* $\frac{3184}{3768}$.
48. Reduce 3 qrs. 2 lb. 2 oz. 6 drs. to the fraction of a cwt. *Ans.* $\frac{22054}{28672}$.

C A S E X I.

To reduce fractions of one denomination to another, retaining the same value.

R U L E.

First, If the fraction given is to be brought from a less to a greater denomination, multiply the denominator by all the denominations, from that given to that sought.

Second, If the fraction given is to be brought from a greater to a less denomination, multiply the numerator by all the denominations, from that given to that sought.

EXAMPLES. (Page 282.)

49. Reduce $\frac{1}{4}$ of a penny to the fraction of a pound?

$$\begin{array}{r} 4 \\ 12 \\ \hline 48 \\ 20 \\ \hline 960 \end{array}$$

Ans. $\frac{3}{960}$

50. Reduce $\frac{3}{960}$ of a pound to the fraction of a penny.

Ans. $\frac{720}{960}$.

51. Reduce $\frac{3}{8}$ of a shilling to the fraction of a pound.

Ans. $\frac{3}{128}$.

52. Reduce $\frac{3}{120}$ of a pound to the fraction of a shilling.
 Anf. $\frac{60}{120}$.
53. Reduce $\frac{3}{4}$ of a pound troy, to the fraction of a pennyweight?
 Anf. $\frac{720}{3}$.
54. Reduce $\frac{720}{3}$ of a penny-weight to the fraction of a pound troy.
 Anf. $\frac{720}{1200}$.
55. Reduce $\frac{3}{4}$ of a dram to the fraction of a cwt.
 Anf. $\frac{3}{143360}$.
56. Reduce $\frac{3}{143360}$ of a cwt. to the fraction of a dram.
 Anf. $\frac{86016}{143360}$.
57. Reduce $\frac{4}{3}$ of a nail to the fraction of a yard.
 Anf. $\frac{4}{60}$.
58. Reduce $\frac{4}{60}$ of a yard to the fraction of a nail.
 Anf. $\frac{64}{80}$.
59. Reduce $\frac{8}{9}$ of a minute to the fraction of a day.
 Anf. $\frac{8}{11520}$.
60. Reduce $\frac{8}{11520}$ of a day to the fraction of a minute.
 Anf. $\frac{11520}{120000}$.

C A S E XII.

To find the value of a fraction in the known parts of the integer.

R U L E.

Multiply the numerator by the number of parts contained in the integer, and divide the product by the denominator, the quotient shews the known parts; if there be any remainder multiply it by the next inferior denomination, and divide by the denominator as before; continue this work till you come to the lowest denomination.

EXAM.

EXAMPLES. (Page 284.)

61. Reduce $\frac{322}{960}$ of a pound to its proper quantity.

$$\begin{array}{r} 322 \\ 20 \end{array}$$

$$960)6440(6s\ 8\frac{1}{2}d\ \text{Ans.}$$

$$\begin{array}{r} 5760 \\ \hline \end{array}$$

$$\begin{array}{r} 680 \\ \hline \end{array}$$

$$\begin{array}{r} 12 \\ \hline \end{array}$$

$$960)8160(8d$$

$$\begin{array}{r} 7680 \\ \hline \end{array}$$

$$\begin{array}{r} 480 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ \hline \end{array}$$

$$960)1920(2\ \text{grs.}$$

$$\begin{array}{r} 1920 \\ \hline \end{array}$$

62. Reduce $\frac{42}{140}$ of a pound to its proper quantity.

$$\text{Ans. } 3s\ 6d$$

63. What is the value of $\frac{1}{2}$ of a shilling?

$$\text{Ans. } 6\frac{1}{2}d$$

64. Reduce $\frac{1}{6}$ of an acre to its proper quantity.

$$\text{Ans. } 3\ \text{r. } 12\ \text{p.}$$

65. Reduce $\frac{68}{112}$ of a cwt. to its proper quantity.

$$\text{Ans. } 2\ \text{qrs. } 12\ \text{lb.}$$

66. Reduce $\frac{17}{24}$ of a foot to its proper quantity.

$$\text{Ans. } 8\frac{1}{2}\ \text{inches.}$$

67. Reduce $\frac{25}{40}$ of a ton to its proper quality.

$$\text{Ans. } 12\frac{1}{2}\ \text{cwt.}$$

68. What is the value of $\frac{3184}{3760}$ of a pound troy?

$$\text{Ans. } 6\ \text{oz. } 12\ \text{dwts. } 16\ \text{grs.}$$

69. Reduce $\frac{22054}{18672}$ of a cwt. to its known value.

$$\text{Ans. } 3\ \text{qrs. } 2\ \text{lb. } 2\ \text{oz. } 6\ \text{drs.}$$

70. What is the value of $\frac{483}{1394}$ of a moidore?

$$\text{Ans. } 9s\ 4\frac{1}{4}d\ \frac{62}{1394}.$$

ADDI-

ADDITION of VULGAR FRACTIONS.

R U L E.

Reduce all the given fractions, to simple ones of the same integer and denominator (if not so already) then the sum of the numerators being made a numerator to the common denominator, makes the fractional sum sought, which may be further reduced, as seems most expedient, or the case will admit.

EXAMPLES. (Page 286.)

Ex. 1. What is the sum of $\frac{2}{4}$ and $\frac{3}{4}$?

$$\begin{array}{r} 2 \\ 3 \\ \hline 5 \end{array} \text{ Anf. } \frac{5}{4}$$

2. What is the sum of $\frac{3}{8}$ and $\frac{5}{8}$? Anf. 1
3. What is the sum of $\frac{2}{3}$ and $\frac{4}{6}$? Anf. $\frac{24}{18}$.
4. What is the sum of $\frac{3}{5}$ and $\frac{6}{9}$? Anf. $\frac{57}{45}$.
5. What is the sum of $\frac{1}{3}$ of $\frac{1}{4}$ and $\frac{3}{8}$? Anf. $\frac{44}{96}$.
6. What is the sum of $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{1}{4}$ of a shilling? Anf. 2s 2d
7. What is the sum of $\frac{3}{5}$ of a pound, $\frac{3}{10}$ of a shilling, and $\frac{5}{8}$ of a penny? Anf. 12s 6½d $\frac{96}{192}$.
8. What is the sum of $\frac{201}{460}$ of a pound, and $\frac{1}{4}$ of a shilling? Anf. 8s 11¼d $\frac{176}{368}$.
9. Add together $6\frac{1}{2}$, $7\frac{1}{4}$ and $8\frac{1}{3}$. Anf. 22 $\frac{13}{40}$.
10. Add $\frac{3}{4}$ of an hour to $\frac{5}{6}$ of a week. Anf. 94 $\frac{3}{16}$.

SUBTRAC-

SUBTRACTION OF VULGAR FRACTIONS.

R U L E.

Prepare the fractions as directed in Addition; then subtract one numerator from the other, and their difference will be a numerator, under which subscribe the common denominator.

EXAMPLES. (Page 288.)

Ex. 1. What is the difference between $\frac{4}{8}$ and $\frac{2}{8}$?

$$\begin{array}{r} \text{from } \frac{4}{8} \\ \text{take } \frac{2}{8} \\ \hline \frac{2}{8} \text{ Anf.} \end{array}$$

2. What is the difference between $\frac{3}{8}$ and $\frac{2}{8}$? Anf. $\frac{1}{8}$.

3. What is the difference between $\frac{13}{23}$ and $\frac{12}{23}$? Anf. $\frac{6}{23}$.

4. What is the difference between $\frac{14}{18}$ and $\frac{9}{18}$? Anf. $\frac{5}{18}$.

5. What is the difference between $12\frac{4}{8}$ and $6\frac{2}{8}$? Anf. $6\frac{2}{8}$.

6. What is the difference between $14\frac{14}{18}$ and $8\frac{14}{18}$? Anf. $6\frac{10}{18}$.

7. What is the difference between $862\frac{12}{18}$ and $224\frac{16}{18}$? Anf. $637\frac{24}{18}$.

8. What is the difference between $961\frac{3}{9}$ and $460\frac{4}{9}$? Anf. $500\frac{8}{9}$.

9. What is the difference between $\frac{3}{8}$ and $\frac{2}{9}$? Anf. $\frac{11}{72}$.

10. What is the difference between $\frac{2}{3}$ of $\frac{8}{9}$ and $\frac{4}{12}$? Anf. $\frac{84}{324}$.

11. What is the difference between 1 and $\frac{16}{24}$? Anf. $\frac{8}{24}$.

12. What is the difference between 64 and $\frac{16}{24}$? Anf. $63\frac{3}{24}$.

MULTIPLICATION OF VULGAR FRACTIONS.

R U L E.

Prepare the given numbers (if they require it) by the rules of Reduction; then multiply the numerators together for a new numerator, and the denominators for a new denominator.

EXAMPLES (Page 289.)

Ex. 1. What is the product of $\frac{2}{3}$ and $\frac{5}{8}$?

$$\begin{array}{r} 2 \times 5 \\ \hline 3 \times 8 \end{array} = \frac{10}{24} \text{ Anf.}$$

2. What is the product of $\frac{4}{5}$ and $\frac{6}{10}$? Anf. $\frac{24}{50}$.
3. What is the product of $\frac{1}{18}$ and $\frac{2}{28}$? Anf. $\frac{2}{504}$.
4. What is the product of $\frac{3}{4}$ and $\frac{6}{9}$? Anf. $\frac{18}{36}$.
5. What is the product of $7\frac{1}{4}$ and $\frac{3}{4}$? Anf. $5\frac{17}{16}$.
6. What is the product of $3\frac{4}{7}$ and 12? Anf. $39\frac{48}{7}$.
7. What is the product of $\frac{3}{4}$, of $\frac{5}{6}$ and 1? Anf. $\frac{15}{24}$.
8. What is the product of $\frac{2}{8}$, of $\frac{3}{4}$, $\frac{2}{3}$ and of $\frac{6}{8}$? Anf. $\frac{232}{1280}$.
9. What is the product of $12\text{ l } 6\text{ s } 8d\frac{3}{4}$ and 3? Anf. $37\text{ l } 0\text{ s } 14d$.
10. What is the product of $6\text{ l } 12\text{ s } 4d\frac{3}{8}$ and 4? Anf. $26\text{ l } 9\text{ s } 7d\frac{3}{8}$.

DIVISION OF VULGAR FRACTIONS.

R U L E.

Prepare the fractions as before directed, then multiply the denominator of the divisor by the numerator of the dividend, for a new numerator; and the numerator of the divisor into the denominator of the dividend for a new denominator, or invert the divisor, and proceed as in multiplication.

EXAMPLES.

EXAMPLES. (Page 290.)

Ex. 1. What is the quotient of $\frac{2}{3}$ divided by $\frac{5}{8}$?

$\frac{5}{8})\frac{2}{3}(\frac{16}{15}$ Anf.

Or thus by inverting the divisor. $\frac{8}{5})\frac{2}{3}(\frac{16}{15}$ Anf. as before.

2. What is the quotient of $\frac{4}{5}$ divided by $\frac{6}{10}$?

Anf. $\frac{40}{30}$.

3. What is the quotient of $\frac{4}{10}$ divided by $\frac{5}{20}$?

Anf. $\frac{100}{50}$.

4. What is the quotient of $\frac{1}{2}$ divided by $\frac{6}{9}$?

Anf. $\frac{27}{24}$.

5. What is the quotient of $7\frac{1}{4}$ divided by $\frac{3}{4}$?

Anf. $11\frac{16}{12}$.

6. What is the quotient of $3\frac{1}{2}$ divided by 12 ?

Anf. $\frac{25}{84}$.

7. What is the quotient of $\frac{3}{4}$ of $\frac{5}{6}$ divided by 1 ?

Anf. $\frac{15}{24}$.

8. What is the quotient of $\frac{7}{8}$ of $\frac{1}{2}$ divided by $\frac{2}{3}$ of $\frac{6}{8}$?

Anf. $\frac{840}{384}$.

9. What is the $\frac{1}{3}$ part of 37 l or $1d$?

Anf. 12 l $6s$ $8d\frac{1}{3}$

10. What is the $\frac{1}{4}$ part of 26 l $9s$ $7d\frac{2}{3}$?

Anf. 6 l $12s$ $4d\frac{5}{6}$.

THE RULE OF THREE DIRECT IN
VULGAR FRACTIONS.

R U L E.

Multiply the denominator of your first number into the numerators of the second and third, for a new numerator; then multiply the numerator of the first number, into the denominators of the second and third, for a new denominator, and place it under the new numerators for the answer, which reduce to its proper quantity.

* N 2

EXAMPLES.

EXAMPLES. (Page 290.)

Ex. 1. If $\frac{1}{4}$ of a yard cost $\frac{2}{3}$ of a pound, what will $2\frac{1}{2}$ yards of the same cost?

$$\begin{array}{ccc} yd. & l. & yd. \\ \frac{1}{4} & : \frac{2}{3} :: \frac{5}{2} = 2\frac{1}{2} \end{array}$$

$$\begin{array}{r} 4 \quad 1 \\ 2 \quad 5 \\ \hline 8 \quad 5 \\ 5 \quad 2 \\ \hline \end{array}$$

$$40N. \quad 10D.$$

$$\frac{40}{10} = 4 = 4l. \text{ the Ans.}$$

2. If 4l buy $2\frac{1}{2}$ yards of cloth, how many yards of the same can I buy for 8 shillings? Ans. $\frac{1}{2}$ yard.

3. If $4\frac{1}{4}$ yards cost 4l 10s, what will $11\frac{1}{2}$ yards cost? Ans. 10l $\frac{17}{8}$.

4. What is the interest of 240l at $4\frac{1}{2}$ per cent.?

$$\text{Ans. } 10l \ 16s$$

5. If in 10 days I spend 1l 15s, how long will 52l 10s last me? Ans. 300 days.

6. If in 300 days I spend 52l 10s, how much will serve me to spend 10 days? Ans. 1l 15s.

7. If 72 gallons of French brandy cost 39l 12s, how many gallons can you buy for 110l? Ans. 200 gal.

8. If 200 gallons cost 110l, what will 72 gallons cost?

$$\text{Ans. } 39l \ 12s$$

9. If $\frac{1}{8}$ of a ship be worth 249l, what part of her may I buy for 747l? Ans. $\frac{3}{8}$ of her.

10. Sold $40\frac{1}{2}$ solid feet of timber for 1l 15s, I demand the price of 50 trees of the same timber, each of which contains $24\frac{1}{2}$ solid feet? Ans. 52l 18s $7\frac{1}{2}d$

11. If $3\frac{1}{2}$ cwt. of sugar cost 5l 5s, what will 5 hhds. cost, each weighing $2\frac{1}{2}$ cwt? Ans. 16l 17s 6d

12. If $11\frac{1}{4}$ cwt. of sugar cost 16l 17s 6d, how much can I buy for 5 guineas? Ans. $3\frac{1}{4}$ cwt.

THE RULE OF THREE INVERSE IN VULGAR FRACTIONS.

R U L E.

Multiply the denominator of the third number into the numerator of the first and second for a new numerator; then multiply the numerator of the third number into the denominator of the first and second, for a denominator, which place under the numerator for the answer, and find the proper quantity as before.

EXAMPLES. (Page 293.)

Ex. 1. Suppose $2\frac{1}{2}$ yards of cloth, 2 yards wide make a coat, how many yards of shalloon $\frac{3}{4}$ wide will line it?

first $2\frac{1}{2} = \frac{5}{2}$. $2 = \frac{2}{1}$. then

As $\frac{2}{1} : \frac{5}{2} :: \frac{3}{4}$

$\begin{array}{r} 4 \\ 5 \\ \hline 20 \\ 2 \\ \hline 40 \end{array}$	$\begin{array}{r} 3 \\ 2 \\ \hline 6 \\ 1 \\ \hline 6 \end{array}$
40N.	6D.

$\therefore 40 = \frac{20}{3} = 6\frac{2}{3}$ yards Anf.

2. What breadth is that cloth that takes $6\frac{2}{3}$ yards of shalloon of $\frac{3}{4}$ wide to line $2\frac{1}{2}$ yards in length thereof?

Anf. 2 yards broad.

3. If an acre of land contains 40 perches in length, and 4 in breadth, what must be the length to make an acre, when the breadth is but $16\frac{1}{2}$ yards?

Anf. $293\frac{1}{2}$ yards.

4. A lends B $50\frac{2}{3}$ l for $6\frac{2}{3}$ months; how long ought B to let A have $21\frac{1}{2}$ l to requite his kindness?

Anf. 15 m. 3 w. $4\frac{1}{3}$ days.

RULE OF FIVE IN VULGAR FRACTIONS.

R U L E.

Take the continual product of the three last and reciprocals of the two first terms, for the answer.

EXAMPLES. (Page 294.)

Ex. 1. What is the interest of 700*l* for 9 months at 5 per cent. per annum?

$$\begin{array}{l} \diamond 100 : \frac{5}{1} :: 700 \\ \diamond \frac{12}{1} : \frac{5}{1} :: \frac{9}{1} \\ \frac{700 \times \frac{9}{1} \times \frac{5}{1}}{\frac{100 \times 12}{1}} = \frac{31500}{1200} = 26\text{ }l. \text{ }5s. \text{ }Ans. \end{array}$$

2. If 700*l* at interest for 9 months gain 26*l* 5*s*, what will 100*l* gain in 12 months at the same rate per cent.?

Ans. 5*l*.

3. If 4 men can do 25½ rods of ditching in 13 days, how many rods may be done by 36 men in 28 days?

Ans. 494⅓ rods.

4. Suppose the salary of 12 persons for 42 weeks is 240*l*, what will be the salary of 28 persons for 92 weeks?

Ans. 1226*l* 13*s* 4*d*

5. If 3 taylors in 1½ day of 13 hours long, can finish 6 suits of cloaths, how many taylors in 9 days of the same length, and working at the same rate, can finish 420 suits of cloaths?

Ans. 35.

6. If the carriage of 1 cwt. 20 miles cost 6½*d* what will the carriage of 5 cwt. cost, being carried 100 miles?

Ans. 13*s*. 6½*d*.

DECIMAL

DECIMAL FRACTIONS.

A decimal fraction derives its name from the latin *decem*, *ten*, which denotes the nature of its numbers, representing the parts of any integral quantity divided into a decuple, or tenfold proportion.

NUMERATION,

Teacheth to read or write any number proposed either by words or characters, according to the following

T A B L E.

6	5	4	3	2	1	2	3	4	5	6
C.M.	X.M.	M.	C.	X.	Units	X. parts	C. parts	M. parts	X.M. parts	C.M. parts

ADDITION OF DECIMALS.

R U L E.

Place every figure underneath those of the same value, which may be done by placing the separating points exactly one under the other, then find their sum as in whole numbers, and point off as many places for decimals as are equal to the greatest number of decimal places in any of the given numbers.

EXAMPLES.

EXAMPLES. (Page 295.)

(1)	(2)	(3)
34.20	6.210	321.3
61.11	7.281	411.3
22.41	6.372	810.0
63.99	4.230	720.9
81.72	3.240	814.5
62.19	7.011	637.2
80.01	4.230	548.1
42.30	8.163	331.2
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>

(4)	(5)	(6)
.324	4.23	23.13
.621	.531	1.8
.423	2.61	6.3
.063	.144	71.01
.27	.621	9.
.414	8.1	.81
.810	4.05	4.23
.540	.801	81.63
.126	.288	1.8
.405	4.131	80.01
.126	1.26	3.6
.801	.144	.9
.513	3.303	9.
.081	.414	40.23
.243	7.101	1.44
.126	.711	60.03
.720	.801	4.23
.144	6.21	.81
.333	3.42	72.
.414	.261	2.34
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>

SUBTRACTION OF DECIMALS.

If your decimals be terminate and complete, place them as in addition, and subtract as in whole numbers.

EXAMPLES. (Page 295.)

(1)	(2)	(3)
From 864.3	58.942	7.6216
Take 421.6	3.641	.0483

(4)	(5)	(6)
From 9.846	.86491	6947.3
Take 2.013	.21312	2461.9

MULTIPLICATION OF DECIMALS.

R U L E.

Multiply the decimals as if they were whole numbers, and from the product cut off as many decimal places as there are in both factors. If there be not so many places, supply the defect by prefixing cyphers.

EXAMPLES. (Page 296.)

$$\begin{array}{r}
 .3046825 \\
 \times .234 \\
 \hline
 12187300 \\
 9140175 \\
 6093650 \\
 \hline
 71.2957050
 \end{array}$$

Multiplication of Decimals.

$$\begin{array}{r} (2) \\ .3046825 \\ \times 23.4 \\ \hline \end{array}$$

$$7.12957050$$

$$\begin{array}{r} (3) \\ .431162163 \\ \times 2.48 \\ \hline \end{array}$$

$$1.06928216424$$

$$\begin{array}{r} (4) \\ .324637254 \\ \times .567 \\ \hline \end{array}$$

$$.184069323018$$

$$\begin{array}{r} (5) \\ 478.216243 \\ \times 12.3456789 \\ \hline \end{array}$$

$$5903.9041808423727$$

$$\begin{array}{r} (6) \\ 1234.56789 \\ \times 478.216243 \\ \hline \end{array}$$

$$590390.41808423727$$

CONTRACTIONS.**R U L E.**

1. Transpose all the figures of the multiplier, in a contrary order to the common way, viz. let the unit's place stand to the left hand.
2. The unit's place of the multiplier must stand under that place of the multiplicand whose decimal place you intend to retain in the product.
3. Begin as in common multiplication, always having regard to the increase of that figure on the right hand the figure that stands over your multiplier, carrying 1 from 5 to 15; 2 from 15 to 25, &c. making use of no more places of your multiplier than those which stand even with your multiplicand to the left hand.

EXAM-

EXAMPLES. (Page 297.)

Ex. 1. Multiply $\cdot 3046825$ by 234 reserving only two decimals in the product.

$\cdot 3046825$ Multiplicand
 432 Multiplier inverted,

$\underline{6093}$
 914
 121

$\underline{71\cdot 28}$ Product.

2. Multiply $\cdot 3046825$ by $23\cdot 4$, reserving only two decimals in the product. Ans. $7\cdot 12$

3. Multiply $\cdot 43162163$ by $2\cdot 48$, reserving only two decimals in the product. Ans. $1\cdot 06$

4. Multiply $\cdot 32437254$ by $\cdot 567$, reserving only three decimals in the product. Ans. $\cdot 183$

5. Multiply $478\cdot 216243$ by $12\cdot 3456789$, reserving three decimals in the product. Ans. $5903\cdot 899$

6. Multiply $1234\cdot 56789$ by $478\cdot 216243$, reserving only the integers in the product. Ans. 590387

DIVISION OF DECIMALS.

R U L E.

Divide as if they were whole numbers, then cut off as many decimal places in the quotient as the number of decimal places in the dividend exceeds the number in the divisor; if there are not so many in the divisor, prefix so many cyphers.

EXAMPLES

EXAMPLES. (Page 298.)

$$57926)31415926.000(542.345$$

$$289630$$

$$245292$$

$$231704$$

$$135886$$

$$115852$$

$$200340$$

$$173778$$

$$265620$$

$$231704$$

$$339160$$

$$289630$$

$$49530$$

$$(2) \quad 57926)31415926($$

$$(4) \quad 57926)31415926($$

$$(6) \quad 57926)31415926($$

$$(8) \quad 57926)31415926($$

$$(3) \quad 57926)31415926($$

$$(5) \quad 57926)31415926($$

$$(7) \quad 57926)31415926($$

$$(9) \quad 57926)31415926($$

CONTRAC-

CONTRACTIONS.

R U L E.

By the first general rule find what place of decimals or integers the first figure of the quotient will possess; consider how many figures of the quote will serve the present purpose; then take as many of the left hand figures of the divisor as are equal to the required number of places in the quotient; in dividing, point one figure off the divisor at each operation, having regard to the increase which would arise from the figures so omitted or pointed off.

EXAMPLES. (Page 300.)

Ex. 1. Divide 12884.970983029794 by 412.35678 so as to have two decimal places in the quotient.

$$\begin{array}{r}
 412.35678 \overline{) 12884.970983029794(31.24} \\
 \underline{12370} \\
 514 \\
 \underline{412} \\
 102 \\
 \underline{82} \\
 20 \\
 \underline{16} \\
 4
 \end{array}$$

2. Divide 5445.418058704098 by 232.14678, so as to have two decimal places in the quotient. Ans. 23.45.

3. Divide 5903.9041808423727 by 12345.6789, so as to have five decimal places in the quotient. Ans. .47821.

4. Divide 590390418.08423727 by 4782162.43, so as to have six decimal places in the quotient. Ans. 123.456789.

REDUCTION OF DECIMALS.

CASE I.

To reduce a vulgar fraction to its equivalent decimal one.

RULE.

Divide the numerator by the denominator, the quotient will be the decimal required.

EXAMPLES. (Page 302.)

Ex. 1. What is the decimal of $\frac{1}{4}$?

$$\begin{array}{r} 4 \overline{) 1.00} \\ \end{array}$$

.25 Ans.

- | | |
|--|------------|
| 2. What is the decimal of $\frac{1}{2}$? | Ans. .5 |
| 3. What is the decimal of $\frac{3}{4}$? | Ans. .75 |
| 4. Reduce $\frac{1}{3}$ to a decimal. | Ans. .3333 |
| 5. Reduce $\frac{7}{12}$ to a decimal. | Ans. .5833 |
| 6. Reduce $\frac{14}{103}$ to a decimal. | Ans. .0725 |
| 7. Reduce $6\frac{3}{4}$ to a decimal or mixed number. | Ans. 6.75 |
| 8. Reduce $8\frac{4}{5}$ to a decimal or mixed number. | Ans. 8.8 |
| 9. Reduce $\frac{226}{3842}$ to a decimal. | Ans. .0588 |
| 10. Reduce $\frac{2402}{4806}$ to a decimal. | Ans. .0499 |

CASE II.

To reduce coins, weights, measures, &c. into decimals.

RULE.

Reduce the given money, weight, measure, &c. into the lowest denomination or name mentioned for a dividend; then reduce the integer into the same denomination for a divisor, the quotient will be the decimal required.

EXAM-

EXAMPLES. (Page 304.)

Ex. 1. Reduce 4 inches to the decimal of a foot.

$$\begin{array}{r} 12 \overline{) 4.000} \\ \hline \end{array}$$

.333 Ans.

2. Reduce $6\frac{1}{2}$ inches to the decimal of a foot. Ans. .5416
3. Reduce 10 inches to the decimal of a foot. Ans. .833
4. Reduce $5\frac{1}{2}$ inches to the decimal of a foot. Ans. .4583
5. Reduce 6 inches to the decimal of a yard. Ans. .166
6. Reduce $9\frac{1}{2}$ inches to the decimal of a yard. Ans. .263
7. Reduce 220 yards to the decimal of a mile. Ans. .125
8. Reduce 660 yards to the decimal of a mile. Ans. .375
9. Reduce 18 shillings to the decimal of a pound. Ans. .9
10. Reduce 16s. 9d. to the decimal of a pound. Ans. .83
11. Reduce 8 ounces to the decimal of a pound troy. Ans. .666
12. Reduce 6 dwts. to the decimal of a pound troy. Ans. .025
13. Reduce 14 pounds avoirdupoise to the decimal of a Ans. .125
cwt.
14. Reduce 6 ounces avoirdupoise to the decimal of a Ans. .375
pound.
15. Reduce 70 gallons to the decimal of a ton. Ans. .27
16. Reduce 90 days to the decimal of a year. Ans. .2465
17. Reduce 9 hours to the decimal of a day. Ans. .375
18. Reduce 8 minutes to the decimal of a day. Ans. .0055

19. Reduce 4 quarts 1 pint of ale to the decimal of a
barrel. Ans. .035
20. Reduce 26 poles to the decimal of an acre. Ans. .162

C A S E III.

To find the value of any decimal fraction, in money, weight, measure, &c.

R U L E.

Multiply the given decimal by the parts of the next inferior denomination, and cut off towards the right hand of the product as many figures as there are places in the given decimal, and those on the left will be integers; then multiply the remaining decimals by the next inferior denomination, and cut off for decimals as before; thus proceed till you have brought it to the lowest parts of the integer.

EXAMPLES. (Page 306.)

Ex. 1. What is the value of .333 of a foot?

$$\begin{array}{r} .333 \\ 12 \end{array}$$

Inches 4.000 Ans.

2. What is the value of .5416 of a foot? Ans. 6½ inches
3. What is the value of .833 of a foot? Ans. 10 inches
4. What is the value of .4583 of a foot? Ans. 5½ inches
5. What is the value of .166 of a yard? Ans. 6 inches
- 6.

6. What is the value of $\cdot 263$ of a yard? *Ans.* $9\frac{1}{2}$ inches
7. What is the value of $\cdot 125$ of a mile? *Ans.* 220 yards
8. What is the value of $\cdot 375$ of a mile? *Ans.* 660 yards
9. What is the value of $\cdot 9$ of a pound sterling? *Ans.* 18s.
10. What is the value of $\cdot 83$ of a pound? *Ans.* 16s. 7d.
11. What is the value of $\cdot 666$ of a pound troy? *Ans.* 8 ounces
12. What is the value of $\cdot 025$ of a dwt. troy? *Ans.* 6 dwts.
13. What is the value of $\cdot 125$ of a cwt. *Ans.* 14 pound
14. What is the value of $\cdot 375$ of a pound avoirdupoise? *Ans.* 6 ounces
15. What is the value of $\cdot 27$ of a ton of wine? *Ans.* 68 \cdot 05 gal.
16. What is the value of $\cdot 2465$ of a year? *Ans.* 89 \cdot 9725 days
17. What is the value of $\cdot 375$ of a day? *Ans.* 9 hours
18. What is the value of $\cdot 005$ of a day? *Ans.* 7 minutes
19. What is the value of $\cdot 035$ of a barrel of ale? *Ans.* 8 \cdot 96 pints
20. What is the value of $\cdot 162$ of an acre? *Ans.* 25 \cdot 92 poles

Decimal Tables of Coin, Weights, & Measures.

TABLE I. COIN.				TABLE III. AVOIRDUPOISE.	
£. Ster. the Integer				112lb. the Integer.	
Sb.	dec.	Sb.	dec.	Qrs.	Decimals.
19	9	9	45	1	25
18	9	8	4	2	5
17	85	7	35	3	75
16	8	6	3		
15	75	5	25		
14	7	4	2		
13	65	3	15		
12	6	2	1		
11	55	1	05		
10	5				
Pence				Pounds	Decimals.
11	045833			20	178571
10	041666			10	089286
9	0375			9	080357
8	033333			8	071428
7	029166			7	0625
6	025			6	053571
5	020833			5	044643
4	016666			4	035714
3	0125			3	026786
2	008333			2	017857
1	004166			1	008928
Farth.				Ounces.	Decimals.
3	003125			10	00558
2	002083			9	005022
1	001042			8	004464
TABLE II. TROY WEIGHT.				7	003906
1lb. the Integer.				6	003348
Dunces	Decimals.			5	00279
11	916666			4	002232
10	833333			3	001673
				2	001116
				1	000558
TABLE III. AVOIRDUPOISE.					
112lb. the Integer.				Drams.	Decimals.
Qrs.	Decimals.			10	000348
1	25			9	000313
2	5			8	000279
3	75			7	000244
				6	000209
				5	000174
				4	000139

9	75
8	666666
7	583333
6	5
5	416666
4	333333
3	25
2	166666
1	083333

Note, This Table of oz. will also serve for inches months, or doz.

Penny weights	Decimals.
10	041666
9	0375
8	033333
7	029166
6	025
5	020833
4	016666
3	0125
2	008333
1	004166

Grains	Decimals.
20	003472
10	001736
9	001562
8	001389
7	001215
6	001042
5	000868
4	000694
3	000521
2	000347
1	000173
$\frac{1}{2}$	000086

Decimal Tables of Coin, Weights, and Measure.

3	•000104	9	•035714	Pints.	Decim.	Bush.
2	•000069	8	•031746	4	•5	4
1	•000034	7	•027	3	•375	3
	•000027	6	•023809	2	•25	2
			5	•019841	1	•125
			4	•015873	Q. pt.	Decim.
			3	•011904	3	•09375
			2	•007936	2	•0625
			1	•003968	1	•03125
			Pints.	Decimals.	Decimals.	Q. Pt.
			4	•001984	•023437	3
			3	•001488	•015615	2
			2	•000992	•007812	1
			1	•000496	Decimals.	Pints.
			A hoghead the Integer.			
			Gallons.	Decimals.	Decimals.	Pints.
			30	•47619	•005859	3
			20	•31746	•003906	2
			10	•15873	•001953	1
			9	•142857		
			8	•126984		
			7	•111111		
			6	•095238		
			5	•079365		
			4	•063492		
			3	•047619		
			2	•031746		
			1	•015873		
			Pints.	Decimals.		
			3	•005952		
			2	•003968		
			1	•001984		
			TABLE VI.			
			MEASURE.			
			LIQUID. DRY.			
			1 gallon, 1 quarter.			
			Integer.			

Decimal Tables of Coin, Weights, and Measures.

10	·005082	4	·010959	Nails.	Decimals.
9	·005114	3	·008219	3	·1875
8	·004545	2	·005479	2	·125
7	·003977	1	·002739	1	·0625
6	·003409	1 day the integer			
5	·002841	Hours.	Decimals.	TABLE X. LEAD WEIGHT. 1 fother the integer.	
4	·002273	20	·833333		
3	·001704	10	·416666	Hund.	Decimals.
2	·001139	9	·375	10	·51282
1	·000568	8	·333333	9	·461538
Feet.	Decimals.	7	·291666	8	·410256
2	·0003787	6	·25	7	·358974
1	·0001894	5	·208333	6	·307692
Inch.	Decimals.	4	·166666	5	·25641
6	·0000947	3	·125	4	·205128
3	·0000474	2	·083333	3	·153846
2	·0000315	1	·041666	2	·102564
1	·0000158	Minute.	Decimals.	1	·051282
TABLE VIII. TIME.		50	·034722	Qurs.	
		40	·027777		
1 year the integer.		30	·020833	2	·025641
Days.	Decimals.	20	·013888	1	·01282
300	·821918	10	·006944	Pounds.	
200	·547945	9	·00625		
100	·273963	8	·005555	14	·0064102
90	·246575	7	·004861	13	·0059523
80	·219178	6	·004166	12	·005494
70	·191781	5	·003472	11	·0050366
60	·164383	4	·002777	10	·0045787
50	·136986	3	·002083	9	·0041208
40	·109589	2	·001388	8	·003663
30	·082192	1	·000694	7	·0032051
20	·054794	TABLE IX CLOTH MEASURE.		6	·0027472
10	·027397			5	·0022893
9	·024657	1 yard the integer.		4	·001831
8	·021918	Quart.	Decimals.	3	·0013736
7	·019178	3	·75	2	·0009157
6	·016438	2	·5	1	·0004578
5	·013699	1	·25		

EXTRACTION OF THE SQUARE ROOT.

R U L E.

1. Begin at the units place and point the given numbers into periods of two figures each, both on the left and right hand of the separating point, the whole numbers must be pointed from right to left, the decimals the contrary way.

2. Find the greatest square that is contained in the first period towards the left hand and set the root in the quotient, and subtract the square from the figures of that period.

3. To the remainder bring down the two figures under the next point for a dividend.

4. Double the quotient for a divisor, and see how often it is contained in the dividend (reserving the units place) and put the answer in the quotient, and also on the right hand of the divisor, then multiply the divisor by the last figure put in the quotient, and subtract the product from the dividend, to the remainder bring down the next period, and proceed thus till all the periods are brought down; if any thing remain add two cyphers thereto and repeat the work, and for every pair of cyphers you add you will have one decimal in the root.

EXAMPLES (Page 309.)

Ex. 1. What is the square root of 144?

$$\begin{array}{r}
 \cdot \cdot \\
 144(12 \text{ root} \\
 1 \\
 \hline
 22) 44 \\
 44 \\
 \hline
 0
 \end{array}$$

2. Let it be required to extract the square Root of 1728.

Ans. 41.

3. What is the square root of 3456?

Ans. 58.

4.

4. Extract the square root of 49864. Ans. 223
5. Extract the square root of 345678. Ans. 587.94
6. What is the square root of 4567893? Ans. 2137
7. What is the square root of 123456789? Ans. 11111.11106
8. What is the square root of 987654321? Ans. 993.807990006
9. What is the square root of .123456789123456789? Ans. .35136560606219953269435

SQUARE ROOT of VULGAR FRACTIONS.

R U L E.

Reduce the fraction or fractional parts to their lowest terms, and if a mixed number, to an improper fraction; then extract the square root of the numerator for a new numerator, and the square root of the denominator for a new denominator.

EXAMPLES. (Page 313.)

- Ex. 1. What is the square root of $\frac{9}{16}$? Ans. $\sqrt{\frac{9}{16}} = \frac{3}{4}$
2. What is the square root of $\frac{16}{81}$? Ans. $\frac{4}{9}$
 3. What is the square root of $\frac{36}{49}$? Ans. $\frac{6}{7}$
 4. What is the square root of $\frac{64}{81}$? Ans. $\frac{8}{9}$
 5. What is the square root of $\frac{144}{121}$? Ans. $\frac{12}{11}$
 6. What is the square root of $6\frac{1}{4}$? Ans. $\frac{5}{2} = 2\frac{1}{2}$

S U R D S.

Are numbers or fractions whose root can never be exactly found.

R U L E

R U L E.

Reduce the fraction or fractional parts to their lowest terms, then reduce them to decimals, and annex those decimals to the whole numbers if any, and extract the root therefrom.

To find the fractional part of the root of a whole number nearly, make twice the remainder a numerator; and add 1 to 4 times the root for a denominator.

EXAMPLES. (Page 313.)

Ex. 1. What is the square root of $\frac{96}{120}$?

First $\frac{96}{120} = \frac{4}{5}$ in its lowest terms; and $\frac{4}{5}$ reduced to a decimal = .8

.800000 (.894 Anf.
64

169)1600
1521

1784) 7900
7136
764

2. What is the square root of 384? Anf. 6.22
3. What is the square root of 864? Anf. 9.3
4. What is the square root of 462.24? Anf. 21.51
5. What is the square root of 26? Anf. 5.1

USE OF THE SQUARE ROOT.

C A S E I.

To find a mean proportional between any two given numbers.

R U L E.

R U L E.

Multiply the two given sides together, and extract the square root of the product, which root will be a mean proportional sought.

EXAMPLES. (Page 314.)

Ex. 1. What is the mean proportional between 18 and 32?

$$\begin{array}{r}
 32 \\
 18 \\
 \hline
 256 \\
 32 \\
 \hline
 \cdot \cdot \\
 576(24 \text{ Anf.} \\
 4 \\
 \hline
 44)176 \\
 176 \\
 \hline
 \end{array}$$

2. I have a piece of timber whose breadth is 20 inches, and depth 12 inches, what is the side of a square equal thereto?

Anf. 15.49

3. A gentleman has a piece of ground whose length is 6 chains, and breadth 4 chains, which he intends to change for a square piece of the same area, you are required to find the length of the side?

Anf. 4.898

4. What is the geometrical mean between $12\frac{1}{2}$ inches, and $18\frac{1}{2}$ inches?

Anf. 15.2

5. Suppose the transverse diameter of an ellipsis be 40 and conjugate diameter 30, what is the diameter of a circle equal thereto?

Anf. 34.6

C A S E II.

To find the side of a square equal in area to any given superficies.

RULE:

R U L E.

Extract the square root of the given superficies, which root will be the side of the square sought.

EXAMPLES. (Page 316.)

Ex. 1. If the area of a circle be 576, what is the side of a square whose superficial content is equal thereto?

576(24 Anf.

4 3 8 4 0

44)176

176

2. The area of a triangle is 240 feet, what is the length of one side of a square equal in area to the triangle?

Anf. 15.49

3. The area of a certain piece of ground is 24 square chains, what is the side of the square that bound it?

Anf. 4.89

4. If the content of a circle be 231.25, what is the side of a square equal thereto?

Anf. 15.2

C A S E III.

Having the area of a circle to find the diameter.

R U L E.

As 355 : 452 :: or as 1 : 1.2732 so is the area to the square of the diameter: or multiply the square root of the area by 1.12837, and the product will be the answer.

2P

EXAMPLES.

EXAMPLES. (Page 317.)

Ex. 1. What is the diameter of a circle whose area is 576 square inches? Ans. 27.09 diam.

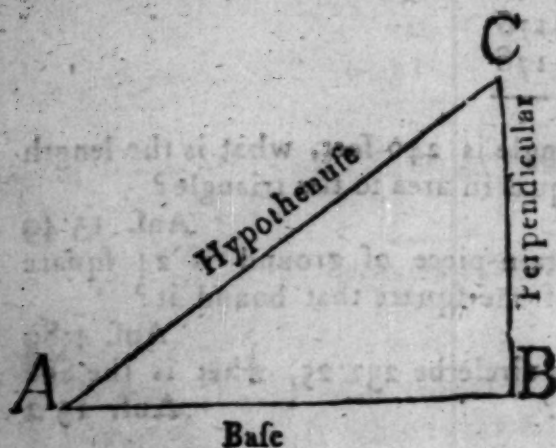
2. What is the diameter of a circle whose area is 7854? Ans. 1

3. What is the diameter of a circular waiter, whose area is 384 inches? Ans. 7 inches

4. The area of one end of a circular piece of timber is 363.05 inches, what is the diameter?

Ans. 21.499 inches.

CASE IV.



Any two sides of a right angled triangle A B C being given to find the other side; the base and perpendicular being given to find the hypothenuse.

R U L E.

The square root of the sum of the squares of the base and perpendicular is the length of the hypothenuse.

EXAMPLES. (Page 318.)

Ex. 1. Suppose the base A B be 48 and perpendicular B C be 20 yards, what is the length of the hypothenuse?

Ans. 52 yards.

The base and hypothenuse being given to find the perpendicular.

R U L E.

The square root of the difference of the squares of the hypothenuse and base, is the height of the perpendicular.

2. Suppose

2. Suppose the base A B 48 yards, and the hypotenuse A C 52, required the perpendicular? Ans. 20 yards

The hypotenuse and perpendicular being given to find the base.

R U L E.

The square root of the difference of the squares of the hypotenuse and perpendicular is the length of the base.

3. Suppose the hypotenuse A C 52 yards, and perpendicular B C 20 required the base? Ans. 48 yards

4. There is a tower whose height is 30 yards, which is surrounded by a moat 40 yards broad, what length must a ladder be, to reach from the outside of the moat, to the top of the tower? Ans. 50 yards

5. Two ships sailed from the same port, one of them sails east, 40 leagues, the other north, till her distance from the other ship be 60 leagues, I demand how far the second ship sailed? Ans. 44 leagues

6. There is a may-pole whose top end was broken off, which struck the ground at 15 feet distance from the foot of the pole, the broken piece was 25 feet, what was the length of the may-pole before this accident happened? Ans. 45 feet

The sum spent by the company, to find out the number of persons, and what they spent a-piece.

R U L E.

The square root of the whole sum spent, reduced to the lowest denomination, is the number of persons, and what they spent a-piece, in the same denomination, the sum is reduced to.

7. A company of men drinking till the reckoning came to 135 $0\frac{1}{2}d$; I demand how many there were in company, and what they paid a piece?

Ans. 25 men, paid $6\frac{1}{2}d$ each.

* P 2

8.

Extraction of the Cube Root.

8. A company of men spent at a feast the sum of $11/5s\ 4d$; I desire to know how many they were in company and what they paid a-piece?

Ans. 52 men, spent $4s\ 4d$ each

9. Suppose 321489 soldiers were ordered into a square battalia, how many must there be in rank and in file?

Ans. 567 men

To know what light is proper for any room:

R U L E.

Multiply the length, breadth, and height together, the square root of that sum is the quantity of light required.

10. Suppose a room was 24 feet long, 16 broad, and 14 high, how much light would be proper for this room?

Ans. 73.3 feet

Having the bung and head diameters of a cask given to find the length of the diagonal line,

R U L E.

Add the square of half the sum of the head and bung diameters, to the square of half the length; the square root of that sum, is the diagonal of the cask.

11. Let the bung be 26, head diameter 22, and length of the cask 30 inches, what is the diagonal line?

Ans. 28.3 inches

EXTRACTION OF THE CUBE ROOT.**R U L E.**

Point every third figure of the given number beginning at the units; then find the nearest cube to the first point, subtract it therefrom, and put the root in the quotient, bring down the figures in the next point to the remainder for a resolvend.

2. Square

2. Square the quotient and multiply it by 3 for a divisor, find how often it is contained in the resolvend, rejecting units and tens, and put the answer in the quotient.

3. Square this new figure, and put it on the right hand of the divisor; but if the new figure should be 1, 2, or 3, then put 01, 04, or 09 to the right hand.

4. Multiply the last figure in the quotient by 30, and also by the former figures; add this product to the divisor, and multiply the sum by the last figure in the quotient; subtract that product from the resolvend, bring down the next point, and proceed as before.

To carry on decimals in the root, add triple cyphers to the resolvend, and for proof cube the root, and take in the remainder if any.

EXAMPLES. (Page 322.)

Ex. 1. What is the cube root of 1728?

$$\begin{array}{r} 12 \\ 1728 \overline{) 1728} \\ \underline{12} \\ 528 \\ \underline{528} \\ 0 \end{array}$$

12 the root.

2. What is the cube root of 2197? Ans. 13
3. What is the cube root of 2744? Ans. 14
4. What is the cube root of 2985984? Ans. 144
5. What is the cube root of 75686967? Ans. 423
6. What is the cube root of 644972544? Ans. 864
7. What is the cube root of 50243409? Ans. 369
8. What is the cube root of 12862247607? Ans. 2343
9. What is the cube root of 163039787847? Ans. 5463
10. What is the cube root of 50023150823736? Ans. 36845
11. What is the cube root of 94996712418949125? Ans. 456285

12. What is the cube root of 94997087172244118016? Ans. 4562856
 13. What is the cube root of 3'46? Ans. 1'51
 14. What is the cube root of 50375'533? Ans. 36'9
 15. What is the cube root of 163040'819968? Ans. 54'63
 16. What is the cube root of 8151'613? Ans. 20'12
 17. What is the cube root of '01286226891? Ans. '2343
 18. What is the cube root of 163'04? Ans. 5'463

To extract the Cube Root of Vulgar Fractions.

R U L E.

Reduce the fraction to its lowest terms, and extract the cube root of the numerator for a new numerator, and the cube root of the denominator for a new denominator.

If a mixed number to an improper fraction; and if a surd to a decimal. To find the fractional part of the cube root of a whole number, make twice the remainder a numerator, and add three times the root to six times its square for a denominator.

EXAMPLES (Page 326.)

Ex. 1. What is the cube root of $\frac{8}{27}$?

$$\sqrt[3]{\frac{8}{27}} = \frac{2}{3} \text{ the root.}$$

- | | |
|---|---------------------|
| 2. What is the cube root of $\frac{27}{64}$? | Ans. $\frac{3}{4}$ |
| 3. What is the cube root of $\frac{512}{729}$? | Ans. $\frac{8}{9}$ |
| 4. What is the cube root of $\frac{27}{125}$? | Ans. $\frac{3}{5}$ |
| 5. What is the cube root of $\frac{72}{243}$? | Ans. $\frac{2}{3}$ |
| 6. What is the cube root of $\frac{108}{256}$? | Ans. $\frac{3}{4}$ |
| 7. What is the cube root of $3\frac{3}{8}$? | Ans. $1\frac{1}{2}$ |
| 8. What is the cube root of $9\frac{1}{8}$? | Ans. $4\frac{1}{2}$ |

THE

THE USE OF THE CUBE ROOT.

CASE I.

To find the side of a cube equal in solidity to any given solid.

RULE.

The cube root of the solid content of the given body will be the side of the cube required.

EXAMPLES. (Page 327.)

Ex. 1. The solid content of a cubical stone is 2197 solid inches, what is the superficial content of one of its sides?

2197 (13 Inches Ans.

1

399) 1197
1197

2. The content of a globe is 2744 solid inches, what is the side of a cube equal thereto? Ans. 14 inches

CASE II.

The dimensions of any solid body being given to find the dimensions of a similar solid of a different capacity.

RULE.

As the cube of a dimension is to its given weight, so is the cube of any like dimension to the weight sought.

EXAMPLES

EXAMPLES. (Page 327.)

3. If an iron ball, 4 inches diameter, weigh 9lb. what will an iron ball of 7 inches diameter weigh?

$$\begin{array}{r} 4 \\ 4 \\ \hline 16 \\ 4 \\ \hline 64 : 9 :: 343 \end{array}$$

$$\begin{array}{r} 9 \\ \hline 64 \left\{ \begin{array}{l} (8) 3087 \cdot 000 \\ \hline (8) 385 \cdot 875 \end{array} \right. \end{array}$$

lb. 48·234 Ans.

4. If a ship of 500 tons burthen be 80 feet long in the keel, I demand the burthen of another ship whose keel is 100 feet long? Ans. 976·56 tons

5. Suppose a cylinder whose diameter is 40 inches, depth 20 inches, and content 89·1 ale gallons; and it were required to make another of the same form that would contain 100 gallons, what must its dimensions be?

Ans. 41·5 diam. 20·78 depth

CASE III.

Having the dimensions of any solid body, to find the dimensions of another similar solid that shall be any number of times greater or less than the solid given.

R U L E.

Multiply the cube of each side by the difference between the solid given and that required, if greater (or divide by the difference, if less) than the solid given, then extract the cube root of each product or quotient, which will give the dimensions of the solid required.

EXAMPLES

EXAMPLES. (Page 330.)

6. There is a cube whose side is 5 feet, I demand the side of another cube, whose solid content is double the former.

$$\begin{array}{r} 5 \\ 5 \\ \hline 25 \\ 5 \\ \hline 125 \\ 2 \\ \hline \end{array}$$

$$250(6.29=6.3 \text{ nearly})$$

$$216$$

$$\begin{array}{r} 11164) 34000 \\ 22328 \\ \hline \end{array}$$

$$\begin{array}{r} 170021) 11672000 \\ 10530189 \\ \hline 1141811 \end{array}$$

7. Suppose another cube whose side is 6.3 feet, I demand the dimensions of another of the same form whose solid content is half as much as the former. Ans. 5.0 feet.

8. Suppose the length of a ship's keel to be 250 feet, the breadth of the midship beam 50 feet, and the depth of the hold 30 feet; I demand the dimensions of another ship of the same form that shall carry only half the burthen.

Ans. 198 keel 39 mid. sh. beam, 23.8 dep. in the hold.

CASE IV.

To find two mean proportionals between two given numbers.

RULE.

R U L E.

Divide the greater extreme by the less, and the cube root of the quotient multiplied by the less extreme, gives the lesser mean: Multiply the said cube root by the lesser mean, the product will be the greater mean proportional.

EXAMPLES. (Page 332.)

9. What are the two mean proportionals between 4 and 108?

$$\begin{array}{r} 4 \overline{) 108} \\ \hline \end{array}$$

$$\text{As } 4 : 12 :: 36$$

12

27(3 Cube root

$$\begin{array}{r} 4 \overline{) 132} \\ \hline \end{array}$$

4

108 Proof.

12 Lesser mean

3

36 Greater mean.

10. What are the two mean proportionals between 4 and 500?
Ans. 20 lesser, 100 greater mean

To extract the Roots of Powers in general.

R U L E.

1. Prepare the given number for extraction, by pointing off from the units' place as the root required directs.
2. Find the first figure of the root by trial, and subtract its power from the given number.
3. To the remainder bring down the first figure in the next period, and call it the dividend.
4. Involve the root to the next inferior power to that which is given, and multiply it by the number denoting the given power for a divisor.
5. Find how many times the divisor may be had in the dividend, and the quotient will be another figure of the root.

6. Involve the whole root to the given power, and subtract it from the given number as before.

7. Bring down the first figure of the next period to the remainder for a new dividend, to which find a new divisor, and so on till the whole is finished.

EXAMPLES. (Page 332.)

1. What is the cube root of 75686967?

$$\begin{array}{r} 75686967(423 \text{ root} \\ 64=4^3 \end{array}$$

$$4^2 \times 3 = 48) 116 \text{ dividend}$$

$$74088 = 42^3$$

$$42^2 \times 3 = 5292) 15989 \text{ second dividend}$$

$$75686967$$

2. What is the biquadrate root of 32015587041?

Ans. 423 root

3. Extract the sur solid, or fifth root of 13542593318343.

Ans. 423 root

4. Extract the sixth root of 5728516973659089.

Ans. 423 root

5. Find the seventh root of 2423162679857794647.

Ans. 423 root

6. Find the eighth root of 1024997813579847135681.

Ans. 423 root

7. Find the ninth root of 433574075144275338393063.

Ans. 423

The

THE SINGLE RULE OF THREE IN DECIMALS.

R U L E.

Reduce vulgar fractions to decimals, and compound numbers either to decimals of the highest names, or to integers of the lowest, as also the first and third to the same name; then state the question, and proceed as in integers.

EXAMPLES. (Page 335.)

Ex. 1. If $\frac{1}{4}$ of a yard of cloth cost $\frac{2}{3}$ of a pound, what will $2\frac{1}{2}$ yards cost?

First $\frac{1}{4} = .25$, $\frac{2}{3} = .4\text{f.}$ and $2\frac{1}{2} = 2.5$ yards; then

$$\begin{array}{rcc} \text{yds.} & \text{£.} & \text{yds.} \\ \text{As } .25 & : .4 & :: 2.5 \\ & & .4 \end{array}$$

$$\begin{array}{r} .25 \overline{) 1.00} (4\text{f. Ans.} \\ \underline{1.00} \end{array}$$

2. If 4l will buy $2\frac{1}{2}$ yards of cloth, how many yards of the same can I buy for 8s? Ans. $\frac{1}{2}$ yd.

3. If $4\frac{1}{2}$ yards cost 4l 10s, what will $11\frac{1}{2}$ yards cost? Ans. 10 89l

4. What is the interest of 240l, at $4\frac{1}{2}\%$ per cent? Ans. £. 10 16

5. If in ten days I spend 1l 15s, how long will 52l 10s last me? Ans. 300

6. If in 300 days I spend 52l 10s, how much will serve me to spend 10 days? Ans. £. 1 15

7. If 72 gallons of French brandy cost 39l 12s, how much can be bought for 110l? Ans. 200

8. If 100 gallons of French brandy cost 110l, what will 72 gallons cost? Ans. £. 39 18

9. If an acre of land contain 40 perches in length and 4 in breadth, what must be the length to make an acre, when the breadth is but $16\frac{1}{2}$ yards? Ans. 293 33.

10. If $\frac{1}{3}$ of a ship be worth 249*l*, what part of her can I buy for 747*l*? Ans. $\frac{4998}{3} = \frac{1}{3}$ of her

11. Sold 40 $\frac{1}{2}$ solid feet of timber for 1*l* 15*s*, I demand the price of 50 trees of the same timber, each of which contains 24 $\frac{1}{2}$ solid feet? Ans. 52 93*l*

12. If 3 $\frac{1}{2}$ cwt of sugar cost 5*l* 5*s*, what will 5 hhds cost, each weighing net 2 $\frac{1}{2}$ cwt? Ans. 16.875*l*

13. If 11 $\frac{1}{2}$ cwt of sugar cost 16*l* 17*s* 6*d*, how much can I buy for 5 guineas? Ans. 3.5 cwt

14. Suppose I buy 2 $\frac{1}{2}$ yards of cloth, 2 yards wide, to make a coat, how many yards of shalloon $\frac{1}{2}$ yard wide will line it? Ans. 6.66 yards

15. What breadth is that cloth which takes 6 $\frac{2}{3}$ yards of shalloon of $\frac{1}{2}$ yard wide to line 2 $\frac{1}{2}$ yards in length thereof? Ans. 1.99 = 2 yards nearly

16. Suppose a deal 14 feet long, 3 inches thick, and 11 inches broad, weigh 120*lb*, or 1 cwt, I demand the weight of 50 deals, 20 feet long, 2 $\frac{1}{2}$ inches thick, and 11 inches broad. Ans. 7142.857*lb*.

RULE OF FIVE IN DECIMALS.

The same preparations must be made here as before directed in the Rule of Three, after which proceed as in integers.

EXAMPLES. (Page 342.)

Ex. 1. What is the interest of 700*l* for 9 months, at 5 per cent. per annum?

$$\begin{array}{rcl} \text{£.} & \text{£.} & \text{£.} \\ *100 & : 5 & :: 700 \\ *12 \text{ mon.} & \text{---} & 9 \text{ month} \\ \hline 12.00 & & 6300 \end{array}$$

$$\begin{array}{r} 5 \\ \hline 12)315.00 \end{array}$$

$$\text{£.26.25} = 26\text{l. } 5\text{s.}$$

*Q

2. If 700*l* in nine months gain 26*l* 5*s* interest, what will 100*l* gain in 12 months at the same rate per cent?

Ans. 5*l* per cent.

3. If 4 men can do 25½ rods of ditching in 13 days, how many rods may be done by 36 men in 28 days?

Ans. 494½ rods

4. Suppose the salary of 12 persons for 42 weeks is 240*l*, what will be the salary of 28 persons for 92 weeks?

Ans. 1226.666*l*

5. If 3 taylors in 1½ day of 13 hours long can finish 6 suits of clothes, how many taylors in 9 days of the same length, and working at the same rate, can finish 420 suits of clothes?

Ans. 35

6. If the carriage of 1 cwt 20 miles cost 6½*d*. what will the carriage of 5 cwt cost being carried 100 miles?

Ans. 13*s* 6½*d*

SINGLE FELLOWSHIP.

R U L E.

Divide the whole gain or loss by the whole stock, the quotient will be a common multiplier, by which multiply every man's part of the stock, the several products will be the respective gain or loss of each.

EXAMPLES.

EXAMPLES. (Page 344.)

Ex. 1. Two partners, A and B, make a stock of 224*l*, A puts in 96*l*, and B 128*l*, they gain 28*l* by trade, what is the gain of each?

<u>£.</u>		
A puts in	96	
B	128	
<u>£. gain</u>		
224)	28.000	(.125 the common multiplier
224		
<u>360</u>	96	128 A gains 12 <i>l</i>
448	.125	.125 B — 16
<u>1120</u>	<u>480</u>	<u>640</u> Proof 28 <i>l</i> .
1120	192	256
<u> </u>	<u>96</u>	<u>128</u>
	12.000	16.000

2. Three persons make a joint stock; A puts in 1500*l*, B 900*l*, and C 600*l*, with which they trade a certain time and gain 600*l*, what is the share of each?

Ans. A gains 300*l*, B 180*l*, C 120*l*

3. Three merchants trading to America, lost goods to the value of 1600*l*. now if A's stock was 2400*l*, B's 9600*l*, and C's 4000*l*, what sum did each man lose?

Ans. A loses 240*l*, B 960*l*, C 400*l*

4. It is required to divide 480*l* between three persons, so that their shares shall be to each other as 1, 2, and 3, respectively?

Ans. 1st person's share 80*l*, 2nd 160*l*, 3d 240*l*

5. Three creditors, A, B, and C, gave credit to a tradesman who became a bankrupt, worth only 920*l*, A credited him for 520*l*, B for 680*l*, and C for 800*l*, what must each of these creditors receive from the bankrupt for their several debts?

Ans. A 239*l* 4*s*, B 312*l* 16*s*, C 368*l*

6. Four merchants, A, B, C, and D, make a joint adventure of 1900*l* to North America; A sent goods to the value of 360*l*, B 480*l*, C 500*l*, and D 600*l*; in three years time they gain 970*l*, required each person's share of the profit?

Anf. A's share 180*l*, B's 240*l*, C's 250*l*, D's 300*l*

7. Four merchants, A, B, C, and D, in partnership together, and with one common stock of 1940*l* gained as follows, viz. A 180*l*, B 240*l*, C 250*l*, and D 300*l*, what was each man's stock?

Anf. 360*l* A's stock, B's 480*l*, C's 500*l*, D's 600*l*

8. Three factors together purchase an East India sloop, towards which A advanced $\frac{3}{7}$, B $\frac{2}{7}$, and C 120*l*, how much paid A and B, and what part of the vessel had C, is required, with the purchase of the whole sloop?

Anf. C's part was $\frac{11}{38}$

A paid £.261 16 4 $\frac{1}{4}$

B paid 229 1 9 $\frac{1}{4}$

Sloop cost 610 8 2

DOUBLE FELLOWSHIP.

R U L E.

Divide the whole gain or loss by the sum of all the products, the quotient will be a common multiplier, by which multiply the product of each man's stock and time, and each product will be the respective share of the loss or gain.

EXAMPLES

7 EXAMPLES. (Page 348.)

Ex. 1. Two merchants, A and B engage in partnership, A puts in 96*l* for 4 months, and B 128*l* for 6 months; they trade and gain 24*l*, what is the gain of each merchant?

First $96 \times 4 = 384$ A's stock and time

$128 \times 6 = 768$ B's stock and time

1152 24·00000 (·02083 common multiplier

Then $384 \times \cdot 02083 = 7\cdot 99872$ A's gain

$768 \times \cdot 02083 = 15\cdot 99744$ B's gain

Proof £.23·99616 = 24*l*. very nearly

2. A and B have a common stock of 224*l*, A gains 8*l* in 4 months, B 16*l* in 6 months; what was each of their particular stocks? Ans. A's stock 96*l*, B's stock 128*l*

3. Three merchants, A, B, and C, traded together, A put in 240*l* for 8 months, B 500*l* for 4 months, and C 200*l* for 5 months, they gained 369*l*; what is each man's share of the gain? Ans. A's share 144*l*, B's 150*l*, C's 75*l*

4. Two merchants together make up a stock of 1200*l*, A's stock continued in company 9 months, and B's 11, they gain 400*l*, which they divide equally; how much did each put in? Ans. A put in 660*l*, B 540*l*

5. Three merchants trade together with one common stock, as follows:—A puts in 50*l* for 4 months, and then puts in 80*l* more for 3 months; B puts in 60*l* for 6 months, and then takes out 40*l* for 4 months; C puts in 100*l* stock for 6 months, and then takes out 50*l* for 5 months; they gained 362*l*, what must each person receive of the gain for his share? Ans. A receives 113·575*l*, B 84·7, C 163·625

6. Four merchants, A, B, C, and D, entered into partnership, thus;—A put in 64*l* 10*s* for 4½ months; B put in 78*l* 15*s* for 6 months; C put in 112*l* 14*s* for 8½ months; and D 125*l* 5*s* for 5½ months; they gain 108*l* 18*s* 4½*d*, what must each merchant receive of the gain?

Ans. A must receive 13*l* 137*d*

B 21*l* 3859*d*

C 44*l* 633*d*

D 29*l* 762*d*

SIMPLE INTEREST.

R U L E.

Multiply the principal ratio and time together, and it will give the interest required.

TABLE OF RATIOS.

at	{	3 per cent. is	·03
		3½	·035
		4	·04
		4½	·045
		5	·05

Note. Ratio is the simple interest of 1*l* for 1 year, at any rate per cent. agreed on, and is thus found :

As 100*l*. : 3 :: 1 : ·03 ratio. As 100 : 5 :: 1 : ·05

EXAMPLES. (Page 350.)

Ex. 1. What is the interest of 364*l* for one year, at 5 per cent. per annum?

£.
364 Principal
·05 Ratio

18·20 = 18*l*. 4*s*. Ans.

2. What is the interest of 486*l* for 5 years at 5 per cent. per annum? Ans. 121*l* 10*s*
3. What is the interest of 884*l* for 7 years, at 5 per cent. per annum? Ans. 309*l* 8*s*
4. What is the interest of 1001*l* for 6 years, at 4½ per cent. per annum? Ans. 270*l* 5*s* 4½*d*
5. What is the interest of 1205*l* for 6 months, at 4 per cent. per annum? Ans. 24*l* 2*s*
6. What is the interest of 640*l* 8*s* 4*d* for 7 years, at 5 per cent. per annum? Ans. 224*l* 2*s* 11*d*
7. What is the interest of 9640*l* 16*s* 8*d* for 4 years and 9 months, at 5 per cent. per annum? Ans. 2289*l* 13*s* 11½*d*

When the interest required is for days only,

R U L E.

Multiply the interest of 1*l* for 1 day, at the given rate, by the principal and number of days for the Answer.

T A B L E.

per cent.	decimals.
3 =	·00008219178
3½ =	·00009589041
4 =	·00010958904
4½ =	·00012328767
5 =	·00013698630

The interest of 1*l* for 1 day is thus found;

As 365 : ·05 :: 1 : ·0001369863, &c.

8. What is the interest of 641/ for 50 days, at 5 per cent. per annum?

•0001369863 interest of 1/ for 1 day
641 principal

1369863
5479452
8219178

878082183

50 number of days

4.3904109150 = 4/ 7s 9½d Anf.

9. What is the interest of 2000/ for 63 days, at 4½ per cent. per annum? Anf. 15/ 10s 8d

10. What is the amount of 5800/ 16s 8d for 260 days, at 4 per cent. per annum? Anf. 5966/ 2s 4d

11. What is the interest of 563/ 12s 6½d for 265 days, at 5 per cent. per annum? Anf. 20/ 9s 2½d

When the rate, time, and interest are given to find the principal.

R U L E.

Divide the interest by the product of the rate and time, the quotient is the principal.

12. What principal being put to interest for 5 years will gain 12/ at 4 per cent. per annum?

years.

5 time

•04 ratio

•20)12.00(60£. Anf.

120

00

13. I demand what principal being put to interest, for 4 years, will gain 124^l at 5 per cent. per annum?

Ans. 620^l

14. What principal being put to interest for 3 years, will gain 69^l 13s 6d at 5 per cent. per annum?

Ans. 464^l 10s

15. What principal being put to interest for 4½ years, will gain 58^l 14s 6d at 4 per cent. per annum?

Ans. 326^l 5s

When the amount, rate, and time are given to find the principal.

R U L E.

Multiply the ratio by the time, add 1 to the product for a divisor, by which sum divide the amount, the quotient will be the principal.

16. What principal will amount to 72^l in 5 years, at 4 per cent. per annum?

$$\begin{array}{r}
 .04 \text{ ratio} \\
 5 \text{ time} \\
 \hline
 .20 \\
 + 1 \cdot \\
 \hline
 1.20
 \end{array}
 \begin{array}{r}
 72.00 \text{ (60}^{\text{l}} \text{ Ans.} \\
 720 \\
 \hline
 00
 \end{array}$$

17. What principal being put to interest will amount to 744^l in 4 years, at 5 per cent. per annum?

Ans. 620^l

18. What principal will amount to 534^l 3s 6d in 3 years, at 5 per cent. per annum?

Ans. 464^l 10s

19. What principal being put to interest will amount to 384^l 19s 6d in 4½ years, at 4 per cent. per annum?

Ans. 326^l 5s

When the principal, interest, and rate are given to find the time.

R U L E.

R U L E.

Divide the interest by the product of the principal and ratio; the quotient is the time.

20. In what time will 60*l* gain 12*l* at 4 per cent. per annum?

principal 60
ratio .04

2.40) 12.00 (5 years Ans.
1200

21. In what time will 620*l* gain 124*l* at 5 per cent. per annum? Ans. 4 years

22. In what time will 464*l* 10*s* gain 69*l* 13*s* 6*d* at 5 per cent. per annum? Ans. 3 years

23. In what time will 326*l* 5*s* gain 58*l* 14*s* 6*d* at 4 per cent. per annum? Ans. 4½ years

When the amount, principal, and rate are given to find the time.

R U L E.

Divide the amount less the principal, by the product of the principal and rate, the quotient is the time.

24. In what time will 60*l* amount to 72*l* at 4 per cent. per annum?

£.	£.
60	72 amount
.04	60 principal

2.40) 12.00 (5 years Ans.
1200

25. In what time will 620*l* amount to 744*l* at 5 per cent. per annum? Ans. 4 years

26. In what time will 464*l* 10*s* amount to 534*l* 3*s* 6*d*, at 5 per cent. per annum? Ans. 3 years

Simple Interest.

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27. In what time will 326*l* 5*s* amount to 384*l* 19*s* 6*d*, at 4 per cent. per annum? Ans. 4½ years

When the principal, interest, and time are given to find the rate per cent.

R U L E.

Divide the interest by the product of the principal and time, the quotient is the rate.

At what rate per cent. will 60*l* gain 12*l* in 5 years?

$$\begin{array}{r} \text{£.} \\ 60 \text{ principal} \\ \text{time } 5 \text{ years} \\ \hline \text{interest} \\ 300)12.00(.04=4 \text{ pr. cent.} \\ 1200 \\ \hline \end{array}$$

29. At what rate per cent. will 620*l* gain 124*l* in 4 years?

Ans. 5*l* per cent.

30. At what rate per cent. will 464*l* 10*s* gain 69*l* 13*s* 6*d* in 3 years?

Ans. 5*l* per cent.

31. At what rate per cent. will 326*l* gain 58*l* 14*s* 6*d* in 4½ years?

Ans. 4*l* per cent.

When the principal, amount, and time, are given to find the rate.

R U L E.

Take the difference between the amount and principal, and divide it by the product of the principal and time, the quotient is the rate.

32. At what rate per cent. will 60*l* amount to 72*l* in 5 years?

$$\begin{array}{r} \text{principal } 60 \quad 72 \text{ amount} \\ \text{time } 5 \quad 60 \text{ principal} \\ \hline 300)12.00(.04=4 \text{ per cent. Ans.} \\ 1200 \\ \hline \end{array}$$

33. At what rate per cent. will 620/ amount to 744/ in 4 years? *Ans.* 5/ per cent.

34. At what rate per cent. will 464/ 10s amount to 534/ 3s 6d in 3 years? *Ans.* 5/ per cent.

35. At what rate per cent. will 326/ 5s amount to 384/ 19s 6d in 4½ years? *Ans.* 4/ per cent.

DISCOUNT.

R U L E.

As the amount of 1/ for the given time, is to 1/, so is the interest of the debt, to the discount required.

Ex. 1. What is the discount of 120/ for 1 year at 5 per cent. per annum?

ratio .05

time 1

.05

+ 1.

1.05 amount of 1/ for the given time,

120

.05

6.00 intrest of the debt

1.05 : 1 :: 6

6

1.05)6.00000(5.714=5/ 14s 3¼d

525

750

735

150

105

450

420

30

2. Sold goods to the value of 50*l* to be paid in 1 year, what must be discounted for present payment, allowing discount at 5 per cent. per annum? *Ans.* 2*l* 7*s* 7*d*

3. What present money will discharge a debt of 200*l* payable at the end of one year, discount being made at 5 per cent? *Ans.* 190*l* 9*s* 6*d*

4. How much ready money for a note of 36*l* due 3 months hence, discount at 5 per cent? *Ans.* 35*l* 11*s* 1*d*

5. What is the discount of 573*l* 16*s* due 3 years hence, discount at 4½ per cent? *Ans.* 68*l* 4*s* 11½*d*

6. What present money will discharge a debt of 130*l* due 1 year and 9 months hence, discount at 4½ per cent. per annum? *Ans.* 120*l* 15*s* 1½*d*

7. How much present money must be allowed for a bill of 399*l* 13*s* 4*d* payable in 73 days, discount being made at 5 per cent. per annum? *Ans.* 395*l* 14*s* 2½*d*

COMPOUND INTEREST.

R U L E.

1. Find the amount of 1*l* for one year at the given rate per cent.

2. Involve the amount thus found to such a power as is denoted by the number of years.

3. Multiply this power by the principal or given sum, and the product will be the amount required.

4. Subtract the principal from the amount, and the remainder will be the interest.

The amount of 1*l* for 1 year, is thus found.

As 100 : 104 :: 1 : 1.04 = the amount at 4 per cent.

As 100 : 104.5 :: 1 : 1.045 = the amount at 4½ per cent.

As 100 : 105 :: 1 : 1.05 = the amount at 5 per cent.

As 100 : 105.5 :: 1 : 1.055 = the amount at 5½ per cent.

* R

EXAMPLES.

EXAMPLES. (Page 361.)

Ex. 1. What is the amount of 50*l* for 3 years at 5 per cent. per annum compound interest?

$$\begin{array}{r}
 1.05 \\
 1.05 \\
 \hline
 525 \\
 105 \\
 \hline
 1.1025 \\
 1.05 \\
 \hline
 55.125 \\
 11025 \\
 \hline
 1.157625 \\
 50 \\
 \hline
 \end{array}$$

$$57.881250 = 57\text{ }l\text{ }17\text{ }s\text{ }7\frac{1}{2}\text{ }d \text{ the amount}$$

2. What is the amount of 100*l* for 4 years, at 5 per cent. per annum? *Ans.* 121*l* 11*s* 0*½**d*

3. What will 100*l* amount to in 3 years, at 5 per cent. per annum, supposing the interest payable half yearly? *Ans.* 115*l* 19*s* 4*½**d*

4. What will 100*l*, the interest payable quarterly, amount to in 1½ year, at 5 per cent. per annum, compound interest? *Ans.* 107*l* 14*s* 9*d*

5. What is the compound interest of 450*l* for 5 years, at 5 per cent. per annum? *Ans.* 97*l* 9*s* 11*½**d*

ARITHMETICAL PROGRESSION.

Any rank of numbers that increase by a common excess or decrease by a common difference, are said to be in arithmetical progression; as 1, 2, 3, 4, 5, &c. and 9, 7, 5, 3, 1, &c.

The numbers which form the series are called the terms of the progression.

Any

Arithmetical Progression.

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Any three of the five following terms being given the other two may be found.

1. The first term
2. The last term
3. The number of terms
4. The common difference
5. The sum of all the terms

PROBLEM I.

The first term, the last term, and the number of terms being given to find the sum of all the terms.

R U L E.

Multiply the sum of the extremes by the number of terms, and half the product is the Answer.

EXAMPLES, (Page 365.)

Ex. 1. The first term of an arithmetical progression is 2, the last term 56, and the number of terms 19, required the sum of the series?

56 greater extreme
2 lesser do.

58 sum
19 number of terms

2)1102

Ans. 551 sum of the series

2. The first term is 3, the last term 33, and the number of terms 11, required the sum of the series?

Ans. 198

3. A man bought 7 yards of cloth, and gave for the first yard 3s, and for the last 27s, what did the 7 yards amount to?

Ans. 5l 5s

Arithmetical Progression.

4. If 60 stones are placed in a right line, exactly a yard asunder, and the first a yard from a basket; what length of ground will that man go who gathers them up singly, returns with them one by one to the basket?

Ans. 1 mile, 70 yards

PROBLEM 2.

The first term, the last term, and the number of terms, being given to find the common difference.

R U L E.

Divide the difference of the extremes by the number of terms less 1, the quotient will be the common difference sought?

EXAMPLES. (Page 365.)

Ex. 1. The extremes are 2 and 56, and the number of terms 19, required the common difference?

$$\begin{array}{r} 19 \quad 56 \\ 1 \quad 2 \\ \hline \end{array}$$

$$\begin{array}{r} 18) \quad 54/3 \text{ common difference} \\ \underline{54} \end{array}$$

2. If the extremes be 3 and 33, and the number of terms 11, it is required to find the common difference?

Ans. 3 common difference.

3. If a person buys 7 yards of cloth, and gives for the first yard 3s, and for the last 27s, what is the common difference of the price of each yard?

Ans. 4s difference per yard.

4. The extremes of an arithmetical progression are 1 and 60, and the number of terms 60, quere the common difference?

Ans. 1.

PROBLEM

PROBLEM 3.

Given the first term, the last term, and the common difference to find the number of terms.

R U L E.

Divide the difference of the extremes by the common difference, the quotient increased by 1 is the number of terms required.

EXAMPLES. (Page 366.)

Ex. 1. The extremes are 2 and 56, and the common difference 3; what is the number of terms?

$$\begin{array}{r} 56 \\ 2 \\ \hline 3 \overline{)54} \\ 18 \\ 1 \\ \hline \end{array}$$

19 Ans.

2. If the extremes be 3 and 33, and the common difference 3, what is the number of terms? Ans. 11

3. Suppose I buy a quantity of cloth, and give for the first yard 3s, and for the last 27s, the common difference of the price of each yard is 4s, required the number of yards? Ans. 7

4. If the extremes of an arithmetical progression be 1 and 60, and the common difference 1, what is the number of terms? Ans. 60

PROBLEM 4.

Given the last term, the number of terms, and common difference, to find the first term.

* R 3

R U L E.

R U L E.

Multiply the number of terms less 1 by the common difference; the product subtracted from the last term leaves the first.

EXAMPLES. (Page 367.)

Ex. 1. The last term is 33, the number of terms 11, and common difference 3, what is the first term?

11 number of terms

1

10

3 difference

30

33 last term

Ans. 3 first term

2. If the last term be 56, the number of terms 19, and common difference 3, what is the first term? Ans. 2

3. A man bought 7 yards of cloth, the last yard of which cost him 27s, the common difference of the price of each yard was 4s, how much did he give for the first yard? Ans. 3s

GEOMETRICAL PROGRESSION

Is when any rank or series of numbers increase by one common multiplier, or decrease by one common divisor.

As 4, 8, 16, 32, &c. here the common multiplier or ratio is 2. *60 6*

And 81, 27, 9, 3, &c. here the common divisor or ratio is 3. *64 60*

PROBLEM 1.

Given the first term, the last term, and the ratio, to find the sum of the series.

RULE.

R U L E.

Multiply the last term by the ratio, and from the product subtract the first term, the remainder divided by the ratio, less 1 will give the sum of the series.

EXAMPLES. (Page 367.)

Ex. 1. The first term of a series in geometrical progression is 1, the last term is 65611, and the ratio 3; what is the sum of the series?

$$\begin{array}{r}
 65611 \\
 3 \\
 \hline
 196833 \\
 1 \\
 \hline
 \text{ratio } 3-1=2 \text{) } 196832 \\
 \hline
 98416 \text{ Answer.}
 \end{array}$$

2. The extremes of a geometrical progression are 2 and 8192, and the ratio 2; what is the sum of the series?

Ans. 16382

3. The extremes of a geometrical series are 1 and 2048, and the ratio 2, what is the sum of the series? Ans. 4095

4. A farmer sold 8 bushels of wheat, and received for the first bushel 2 farthings, and for the last 32768 farthings, the ratio or increase of each bushel is 4; what was the 8 bushels sold for?

Ans. 43690qrs = £.45 10 2½

PROBLEM II.

Given the first term, the ratio, and number of terms, to find any other term assigned.

R U L E.

1st. Find a few of the leading terms, over which place their indices.

2.

2. Find what figures of the indices when added together, will give the index of the term wanted.

3. Multiply the numbers standing under such indices into each other, the last product will be the term required.

4. In any series not proceeding from unity, proceed as above, only observe to divide every product by the first term. The first term of the indices must begin with a cypher, except that term be equal with the ratio, and in that case the indices must begin with an unit; and when the indices begin with a cypher the sum of the indices made use of must be less by 1 than the number of terms given.

EXAMPLES. (Page 368.)

Ex. 1. Suppose a man agrees for nine fat oxen, to pay only the price of the last, reckoning 1*l*. for the first, 2*l*. for the second, &c. doubling the price to the last, what was the price of of the oxen ?

First { 0. 1. 2. 3. 4. 5. indices
1. 2. 4. 8. 16. 32. terms

And $4 + 4 = 8$ the numbers of terms, less 1.

Also $16 \times 16 = 256$ *l*. the Ans.

2. A sum of money was to be divided amongst 13 persons, the first to have 2*l*. the second 4*l*. &c. increasing by two to the last, what must he receive ?

Ans. *£*.8192

3. What debt will be discharged in 12 months, by paying 1*s*. the first month, 2*s*. the second, 4*s*. the third, and so on, each succeeding payment being double the last, and what will the last payment be ?

Ans. debt is 204*l*. 15*s*. and the last payment 102*l*. 8*s*.

4. A gentleman bequeathed to his 8 children, the whole of his estate in the following manner, viz. to the youngest child 2*l*. to the next youngest 8*l*. and so on, every child's fortune to exceed the next younger in a quadruple proportion, how much must the eldest receive, and what was the whole of the testator's estate ?

Ans. 32768*l*. eldest's part ; 43690*l*. whole estate.

PERMUTATION,

Is the shewing how many different ways any given number of things may be changed, so that no two parcels may have all their quantities placed in the same situation.

RULE.

Multiply all the terms of the natural series of numbers, from 1 up to the given number, continually together, the last product will be the answer required.

EXAMPLES. (Page 370.)

Ex. 1. How many changes may be rung on 8 bells ?

Ans. $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 = 40320$.

2. For how many days can 9 persons be placed in a different position at dinner ?

Ans. 362880 days

3. Six scholars taken out of a free school to be sent to the University, were to be entertained there for a certain sum of money with two meals a day, so long and no longer, than, that sitting altogether on a form at every meal, they might sit in a contrary position ; the question is how long they were to stay there, and how many positions may be made by them ?

Ans. 720 positions, 360 days to stay.

4. How many changes may be made of the words in the following sentence, " Doctores, elementia velint ut dicere prima." ?

Ans. 720 changes.

SINGLE POSITION,

Teacheth to resolve such questions as cannot be resolved by any of the former rules, the results of which are proportional to their supposition.

RULE.

R U L E.

Take any fit number, and perform the same operations with it as are to be performed in the question, then say, as the false number resulting is to the true number given, so is the whole or any part of the false number to the whole or respective part of the number sought.

EXAMPLES. (Page 371.)

Ex. 1. Three men, A, B, and C, purchase a ship for 440*l*. B paid twice as much as A, and C 4 times as much as B, how much did each man pay?

Suppose A paid 60*l*.

then B must pay 120

and C 480

sum 660

Then as 660 : 60 :: 440

60

l.

660) 26400 (40 A's share.

consequently $40 \times 2 = 80$ B's share.

and $80 \times 4 = 320$ C's share.

l. 440 Proof.

2. It is required to divide 60 crowns amongst three persons, A, B, and C, so that A may have $\frac{1}{2}$, B $\frac{1}{3}$, and C $\frac{1}{6}$; query each man's share?

Ans. A's share 29 $\frac{2}{3}$ *l*. B's 19 $\frac{2}{3}$ *l*. C's 11 $\frac{2}{3}$ *l*.

3. A person, after spending $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$ of his money had 104*l* left, how much had he at first? Ans. 480*l*.

4. A person delivered to another a sum of money unknown to receive simple interest for the same at 5 per cent. per annum, and at the end of 12 years he received for principal and interest 500*l*. what was the sum lent? Ans. 312*l*. 10*s*.

5. A can do a piece of work in 12 days, B can do the same in 8 days, and C in 6 days, how long will it take them all to do the same piece of work? Ans. $2\frac{2}{3}$ days

DOUBLE POSITION,

Teacheth to resolve questions, by making two suppositions of false numbers.

R U L E.

1. Take any two convenient numbers, and proceed with each according to the conditions of the question.
2. Find how much the results are different from the result in the question.
3. Multiply each of the errors by the contrary supposition, and find the sum and difference of the products.
4. If the errors are alike, that is, both greater or both less than the given number, take their difference for a divisor, and the difference of their products for a dividend, but if unlike, that is, one too much and the other too little, then take their sum for a divisor, and the sum of their products for a dividend, the quotient will be the answer.

EXAM^{PL}

EXAMPLES. (Page 374.)

Ex. 1. A man had 900 sheep, but by several losses they are very much reduced, for at one time he lost $\frac{1}{2}$ as many as he now hath; at another time $\frac{1}{3}$ as many; and the third time $\frac{1}{4}$ as many, how many hath he now left?

First, suppose he had 12
 the $\frac{1}{2}$ is 6
 $\frac{1}{3}$ is 4
 $\frac{1}{4}$ is 3

sum 25
 should be 900

1st error—875
 2d sup. 24

3000
 1750

errors { 875 21000
 850 10200

25)10800(432 Ans.

100

80

75

50

50

Second, suppose 24
 the $\frac{1}{2}$ = 12
 $\frac{1}{3}$ = 8
 $\frac{1}{4}$ = 6

sum 50
 should be 900

2d error—850
 1st sup. 12

10200

he hath 432 now left
 the $\frac{1}{2}$ is 216
 $\frac{1}{3}$ is 144
 $\frac{1}{4}$ is 108

900 proof.

2. It is required to divide 300*l.* between two persons, A and B, in such proportion that A may have 72*l.* more than B, what is each person's share?

Ans. A's share is 186*l.* B's 114*l.*

3. Two persons, A and B, discoursing of their money, says A, if you will give me 50*l*. I shall have as much as you ; says B, if you will give me 44*l*. I shall have twice as much as you ; how much had each person ?

Ans. A had 232*l*. B 376*l*.

4. Two men, A and B, performed a piece of work in 30 days, for which they received 3*l*. 14*s*. A's wages was 2*s*. 8*d*. a day, and B's 2*s*. 2*d*. a day, how many days did each work ?

Ans. A worked 18 days, B 12 days.

5. A, B, and C, are indebted to D, who hath forgotten their particular debts, but remembered that A and B's debts together was 100*l*. C and B's 160*l*. and the debt of A and C together was 140*l*. what is each man's particular debt ?

Ans. A's debt 40*l*. B's 60*l*. C's 100*l*.

6. An ornament with ease you'll find,
From what is underneath subjoined;
Which greatly doth become the fair,
In every season of the year.

The name of the ornament is composed of three letters in the alphabet, the first letter's place is three times that of the second, the third is five times that of the first, +1, and the sum of all the three letters' places is 20.

• S

MISCELLANEOUS

MISCELLANEOUS QUESTIONS.

Quest. 1. There are two numbers, the least whereof is 80, and their difference 28, what is the greater number, and sum of both ?

Ans. 108 greater no. 188 sum of both.

2. A sheep-fold was robbed three nights successively, the first night half the sheep were stolen and half a sheep more; the second night half the remainder were lost and half a sheep more; the last night they took half what were left and half a sheep more, by which time they were reduced to twenty; how many were there at first ?

Ans. 167 sheep at first.

3. From the creation to the flood was 1656 years; thence to the building of Solomon's temple 1336 years; thence to Mahomet, who lived 622 years after Christ, 1630 years; in what year of the world was Christ then born;

Ans. A. M. 4000.

4. A is 13 years younger than B, and 17 years older than C, who in the year 1765 was known to be 24 years of age; how old was each of these persons in 1787 ?

Ans. C 46, A 63, and B 76 years.

5. If the mean distances between the earth and sun be 81 million of miles, and between the earth and moon 240 thousand, how far are those two luminaries asunder in an eclipse of the sun, when the moon is lineally between the earth and sun, and in another of the moon, when the earth is in a line between her and him ?

Ans. In an eclipse of the moon 81240000 miles.

In an eclipse of the sun 80760000 miles.

6. The building of Solomon's temple was in the year of the world 3000. Troy was, by computation, built 443 years before the temple, and 260 years before London; now Carthage was built 113 years before Rome, founded 744 years before Christ, born anno mundi 4000; is London or Carthage the ancientest city, and how much ?

Ans. London was built before Carthage 326 years.

7. Two men, A and B, enter into partnership, and after some time A had disbursed 17*l.* 3*s.* 3*d.* B had paid 10*l.* 10*s.* they are now indebted 16*l.* 13*s.* and from the beginning of their

their partnership they are to pay equal, query what has each now to pay of the debt?

Ans. A has to pay £.4 19 10 $\frac{1}{2}$

B - - - 11 13 1 $\frac{1}{2}$

8. The semidiameter of the earth's orbit, or annual path round the sun in the center of the system, is about 81000000 miles, that of Venus 59000000, when they are both on the same side the sun, they are in peregæo, when on different sides, in apogæo, what is the difference of their distances in both these circumstances?

Ans. 118000000 miles.

9. What number taken from the square of 46, will leave 12 times 32?

Ans. 1732.

10. What sum of money must be divided amongst 12 men, so that they may receive 18*l.* 6*s.* 4 $\frac{1}{2}$ *d.* each?

Ans. £.219 16 6

11. What difference is there between twice thirty-five, and twice five and thirty?

Ans. 30.

12. The remainder of a division sum is 20, the quotient 423; the divisor is the sum of both and 19 more; what then was the number to be divided?

Ans. 195446.

13. There are two numbers, the greatest of them is 73 times 109, and their difference 17 times 28, what is their sum and product?

Ans. 15438 sum, and 59526317 their product.

✓ 14. By industry, a merchant, in ten years, found himself possessed of 13000*l.* it appeared from his books, that the last three years he had cleared 873*l.* a year, the three preceding but 586*l.* and before that but 364*l.* a year, you are required to find how much he had to begin with, and how much he gained?

Ans. 5833*l.* gained, 7167*l.* to begin with.

15. A person dying, left his widow the use of 10000*l.* to a charity he bequeathed 1693*l.* to each of his three nephews 2460*l.* to each of his four neices 2100*l.* to twenty poor housekeepers ten guineas each, and 400 guineas to his executors, what must he have died possessed of?

Ans. 28103*l.*

16. What number added to the 43d part of 4429 will make the sum 240?

Ans. 13 $\frac{1}{2}$.

17. What number deducted from the 26th part of 2262 will leave the 87 part of the same? Ans. 61.

18. What number multiplied by 72084 will produce 5190048 exactly? Ans. 72.

19. My purse and money, quoth Dick, is worth 12s. 8d. but the money is worth 7 times the purse, pray what was there in it? Ans. 11s. 1d.

20. A, B, and C, play a concert at hazard, and at making up accounts, it appears that A and B together brought off 13l. 10s. B and C together 12l. 12s. and A and C together won 11l. 16s. 6d. what did they severally get?

Ans. C got £.5 9 3
A 6 7 3
B 7 2 9

21. If the $\frac{2}{3}$ of 6 be 3, what will the $\frac{3}{4}$ of 20 be? Ans. 7 $\frac{1}{2}$.

22. A person was possessed of $\frac{3}{4}$ share of a copper mine, and sold $\frac{1}{4}$ of his interest therein for 1710l. what was the reputed value of the whole property at the same rate?

Ans. 3800l.

23. A clock hath two hands or pointers, the first, A, goes round once in 12 hours, the second, B, once in an hour; now if they both set forward together, in what time will they meet again? Ans. 1 hour 5 $\frac{5}{11}$ min.

24. There is an island 73 miles in circumference, and 3 footmen all start together, to travel the same way about it, A goes 5 miles a day, B 8, and C 10, when will they all come together again? Ans. 5329 days.

25. Water runneth into a cistern by a pipe that will fill it in 8 hours, and runneth out by another that will empty it in 22 hours, in what time, both running together, will the cistern be full? Ans. 12 $\frac{4}{11}$ hours.

26. If the sun moves every day one degree, and the moon 13, and at a certain time the sun being at the beginning of Cancer, and in three days after the moon in the beginning of Aries, the place of their next following conjunction is required? Ans. 10 $\frac{3}{4}$ degrees of Cancer.

27. A gentleman has an estate of 400l. per annum, but will have it divided into two farms, in proportion to each other as 3 to 5, what is the yearly value of each?

Ans. 150l. 250l.
28.

28. The sum of 2000*l* is to be divided amongst three men in such a manner that if A has 3*l*. B shall have 5*l*. and C 8*l*. how much must each man have?

Ans. A 375*l*. B 625*l* and C 1000*l*.

29. Three workmen can do a piece of work in certain times, viz. A can do it in three weeks, B can do thrice the work in 8 weeks, and C 5 times the work in 12 weeks; in what time can they finish it jointly?

Ans. 5 days 4 hours.

30. A is man enough to do a certain piece of work in an hour, B can do as much in 3 hours, C as much in 5 hours, and D as much in 7 hours; in what time can they do three times the work, all working together?

Ans. 1 hour 47 min. $23\frac{2}{11}$ sec.

31. Supposing the earth to be 81000000 miles distant from the sun; I would know at what distance from him another body must be placed, so as to receive light and heat double to that of the earth?

Ans. 57275649 miles.

32. A bullet of cast iron, 4 inches diameter, weighs experimentally 9lb. what is the difference of the weight of one that is $13\frac{1}{2}$ inches in diameter, and another that is no more than $7\frac{1}{2}$ inches?

Ans. $13\frac{1}{2}$ lb.

33. Suppose a stone let go into an abyss, should be stopped at the end of the eleventh second after its delivery, what space would it have gone through?

Ans. 1946.083 feet.

N. B. The velocity acquired by heavy bodies falling near the surface of the earth, is $16\frac{1}{2}$ feet in the first second; and as $16\frac{1}{2}$ feet are to the square of one second, or 1, so is the given distance to the square of the seconds required.

Or by multiplying $16\frac{1}{2}$, the descent of a heavy body in one second of time, by as many of the odd numbers, beginning from unity as there are seconds in the given time; viz. by 1 for the first, 3 for the second, 5 for the third, 7 for the fourth, &c. the sum total will give the space it hath passed.

34. In what time would a musquet ball dropped from the top of Salisbury steeple, said to be 400 feet high, be at the bottom?

Ans. 4.987, or 5 seconds nearly.

35. If 4 longitude students in 40 days of 14 hours long,

* S 3

can

can calculate one nautical ephemeris, in how many days of 10 hours long, can 12 of the same sort of students calculate the same ephemeris, to find out the longitude for a year?

Anf. $18\frac{2}{3}$ days.

36. My water tub holds 147 gallons, the pipe usually brings in 14 gallons in 9 minutes, the tap discharges at a medium, 40 gallons in 31 minutes; supposing these both carelessly to be left open, and the water to be turned on at two o'clock in the morning, the servants at five finding the water running shuts the tap, and are solicitous to know in what time the tub will be filled after this accident, in case the water continues flowing from the main?

Anf. 3 min. $48\frac{228}{434}$ sec. after 6 o'clock.

37. If a cistern or reservoir of water 25 feet high, with a pipe of 1 inch diameter, in 40 hours, discharge 1000 hogheads of water; how many hogheads will a cistern 16 feet high, discharge with a pipe of 2 inches diameter, in 24 hours?

Anf. 1920 hhds.

38. A, B, and C made a stock to trade with, and all laid in together 560*l*. they trade and gain 150*l*., at the end of their partnership, A took up 40*l*., B 50*l*. and C 60*l*. what had each man in stock?

Answer A 149 $\frac{1}{3}$ *l*

B 186 $\frac{2}{3}$ *l*

C 224*l*

39. A in company with B and C put into stocks 168*l* for 5 months, B put in a sum of money for 8 months, and C 400*l*. for a certain time, they gain 90*l*. whereof A must have 18*l*. B 12*l*. and C 60*l*. how much was the stock of B, and what time did the stock of C continue in company?

Anf. B's stock was 70*l*. C's stock continued 7 months.

40. The joint stock of A and B gained them after the rate of 20*l*. per cent. per annum, 50*l*. a-piece; A had 400*l*. in stock, and the stock of B continued but 5 months, what money had B in stock, and how long did A continue in company?

Anf. A continued $7\frac{1}{2}$ months, B put into stock 600*l*.

41. It is required to divide 300 acres of land amongst A, B, C, and D, whose estates are 100*l*. 300*l*. 600*l*. and 1000*l*. respectively per annum, and the value of the land allotted

to each is 5, 8, 12, and 15 shillings an acre; what number of acres must each person have?

Anf. A must have 34.45 acres
 B 64.593 do.
 C 86.124 do.
 D 114.832 do.

42. A, B, and C, are to share 100,000*l* in the proportion of $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$ respectively, but C's part being lost by his death, it is required to divide the whole sum equitably between the other two?

Anf. A's part is 57142 $\frac{282}{329}$ *l*
 B's 42857 $\frac{47}{329}$ *l*

43. Four merchants, A, B, C, and D, gain 2000*l*. by trade, whereof half of A's share is equal to $\frac{3}{4}$ of B's, $\frac{2}{3}$ of C's, and $\frac{5}{6}$ of D's, what share had each?

Anf. A's share 691 $\frac{223}{347}$ *l*
 B's 461 $\frac{33}{347}$ *l*
 C's 432 $\frac{96}{347}$ *l*
 D's 414 $\frac{342}{347}$ *l*

44. If 12 oxen eat up $3\frac{1}{3}$ acres of pasture in 4 weeks, and 21 oxen eat up ten acres of like pasture in 9 weeks, how many oxen will eat up 24 acres in 18 weeks, the grass being allowed to grow uniformly?

Anf. 36

45. A select company dining at a tavern, the reckoning amounted to 13*s* a-piece; but three of them flinking away, the rest had 6*s* 6*d* a piece more to pay; quere the number of persons at first?

Anf. 9

46. Supposing a cow to bring forth a she-calf at the age of two years, and then to continue yearly to do the same, and every one of her brood to bring forth a she-calf at the age of two years, and afterwards yearly likewise; how many may spring from the old cow and her brood in 40 years?

Anf. 165580140 increase required

47. Suppose a man to have a calf, which at the end of three years begins to breed, and afterwards a female calf every year; and that each calf begins to breed in like manner at the end of three years, bring forth a cow-calf every year, and that these last breed in the same manner, &c. &c. to determine the owners whole stock at the end of 20 years?

Anf. 1278 the whole stock required.

APPENDIX.

Containing various Forms of Acquittances, Promissory Notes, Bills of Exchange, Letters of Advice, Letters of Credit, &c. all of which are adapted to such Circumstances as occur in real Business.

20 MA 59

A GENERAL RECEIPT.

Received January 9, 1793, of Mr. James Jorden, the sum of forty pounds in full, for one quarter's rent, due at Christmas-day last, and of all demands,

By me, WALTER COLLINS.

£.40 0 0

A RECEIPT for ACQUITTANCE or RENT PAID.

Received this 12th day of January, 1793, of Mr. William Ward, the sum of thirty-six pounds ten shillings in money, which, with nine pounds six shillings more, disbursed by the said William Ward, for taxes and reparations of the said messuage and tenements he now occupies, situate in High-street, Birmingham,

mingham, makes in the whole, the sum of forty-five pounds sixteen shillings, and is in full of half a year's rent, due to me out of the said premises at Christmas-day last. I say received by me,

£.45 16 0

JOHN SLONE.

A RECEIPT FOR INTEREST DUE ON BOND.

Received this 16th day of January, 1793, of Mr. Samuel Green, the sum of five pounds, in full, for one year's interest of 100%. due to me at Christmas last, on bond from the said said Samuel Green. I say received by me,

JOHN COPE.

£.5 0 0

AN ACQUITTANCE FOR A LEGACY.

Received this 9th day of July, 1793, of Mr. John Causer, Executor of the last will and testament of Benjamin Bradley, late of Dudley, in the county of Stafford, deceased, the sum of one hundred pounds, in full, of a legacy bequeathed to me, in and by the last will and testament of the said Benjamin Bradley. I say received in full of all demands, by me,

WILLIAM PARKES.

£.100 0 0

An Acquittance for the Purchase-Money on executing of a Conveyance, to be indorsed on the Back of the Deed.

Received the day and year within-written, of the within-named William Hollins, the sum of sixty pounds, being the full consideration money within-mentioned to be paid to me. I say received, by me,

SAMUEL FALLOWS.

£.60 0 0

The

*The Form of promissory Notes, or common Notes for Money.**The Form of one payable on demand.*

I promise to pay to Isaac Watts, or Order, the Sum of Twenty Pounds, on Demand, for Value received; Witness my Hand this 1st Day of July, 1793.

HENRY LOWE.

£. 20 0 0

The Form of one payable at a certain Time.

Birmingham, June 1, 1793.

Three months after Date, I promise to pay to Mr. John Goodal, or Order, the Sum of Twelve Pounds, for Value received by me

W. T.

£. 12 0 0

*Form of Inland Bills of Exchange.**Form of one payable at Sight.*

£. 50 0 0

Birmingham, July 9, 1793.

At Sight pay Mr. Thomas Shirley, or Order, the Sum of Fifty Pounds, the Value received of Mr. James Shirley, and place it to Account, as per Advice from

WM. SHIRLEY.

To Mr. John Pallett, }
High-street, Worcester. }

Form

Form of one payable after Date.

£ 50 0 0

London, July 4, 1793.

Two Months after Date pay Mr. John Cox, or Order,
the Sum of Fifty Pounds Sterling, Value in ourselves, and
place it without more advice to the Account of

JOHN SHARP.

To Mr. Thomas Donn, }
Moor-street, Birmingham, }

Liverpool, July 15, 1793.

SIR,

Pay Mr. Thomas Phillips, or bearer, One Hundred
Pounds, on Demand, and place it to my Account.

WILLIAM LARGE.

To Mr. John Hewett, plater, }
High Holbourn, London. }

Form of a Correspondent's Letter of Advice.

Mr. John Day,

SIR,

Dunkirk, Dec. 3, 1793.

By this Post I have drawn on you for three Hundred
Crowns, at 34d. payable to yourself, Value of Monf.
Edward Duriert, which with my other Bills depending,
please to honour, and the timely remittance shall be punct-
ually made you by

Sir,

Your very humble Servant,
WALTER BROOKES.

To Mr. George Browne, }
Merchant, Bristol. }

FORM OF LETTERS OF CREDIT.

SIR,

Birmingham, July 22, 1793.

Please to furnish the Bearer hereof, Mr. Thomas Wilkes,
with the Sum of Two Hundred Pounds as he shall require
the

the same, and place it to my Account, for which this Letter of Credit, with his receipt, shall be your sufficient Voucher and Warrant, giving upon Payment a Line or two of Advice to

Your real Friend,
THO. GILL.

To Mr. Humphry Vaughton, }
Merchant, at Liverpool.

THE RECEIPT.

Received Augt. 24, 1792, of Mr. Humphry Vaughton, the Sum of Two Hundred Pounds, by virtue of Mr. Tho. Gill's Letter of Credit, of July 22 last, for the said Sum.

THOMAS WILKES.

£. 20 0 0

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FINIS.

